The Socio-technical Dynamics of ICT Innovation: A Social Shaping Analysis of Portals

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ABSTRACT

This PhD thesis presents a longitudinal study of the dynamics of the innovation process of a standardised technology. The study addresses the factors that shape technology decision-making along the entire technology life cycle - from design to implementation - within the context of a complex socio-technical setting.
The development of the Internet led to acceleration in the diffusion of Inter-Organisational Networks and Systems (IONS), particularly of portals. Portals are defined as linked electronic platforms with a single point-of-entry, independent of time and space, and that enable collaboration through access to multiple sources from different organisational information systems. Organisations develop and implement portals to respond to market pressures, for example in order to rationalise procurement.

The thesis attempts to expand the understanding of the socio-technical dynamics patterning both the decision-making process and the outcomes of complex ICT innovation projects. The thesis seeks to overcome the shortcomings of existing social and economic research on inter-organisational standardisation by redressing the limitations in terms of empirical scope and analytical frameworks of, on the one hand, studies of standard setting processes which neglect the wider and subsequent context of implementation and, on the other hand, of 'diffusion of standards' studies which ignore the way in which standards evolve in their implementation. This study specifically answers theoretical and practical questions of ICT innovation dynamics in a complex multi-spaced setting, combining economic, technical and sociological theories. The research draws on the Social Shaping of Technology (SST) perspective by explaining ICT innovations as historical and contexted actor-focussed technological change processes. The thesis develops a Multi-level Space of Innovation Dynamics (MSID) framework to capture the dynamics of standardised portal technology development and its outcomes on two levels: at a micro level, focusing on individuals and groups in the adopting organisation (zoom in), and at the meso level, addressing the effects that the dynamics have in the broader context of

the sector (zoom out). Jørgensen's concept of 'arena' is used to analyse the way in which the actors involved at the company and the industry level are configured together. The turbulent dynamics are analysed as the outcome of complex processes of change involving the configuration and re-configuration of the various arenas and networks in which the array of involved organisational actors are embedded.

The contribution to existing knowledge is based on the development of the MSID framework and its application to a complex multi-layered and longitudinal case study based in the automotive industry. The researcher's unique extensive access as a participant and analyst to the complex setting of the portal development was essential to develop the framework and to illustrate the ways in which theoretical concepts can be grounded in real empirical cases. The research finds that ICT innovations are shaped by history and context of the adopting organisation and the actors involved. The extremely complex organisational politics of decision-making processes were patterned by the configuration of the project and the management of expertise. Interactions and realignments amongst this complex set of socio-technical factors led to a drift in the subsequent outcomes. This study supports the socio-technical analysis of supply chains as mutually shaped by technology and the adopting user organisation. Finally, the study also provides organisations with rich sociological insights that could translate into the planning of similar technology-driven projects.

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DECLARATION of ORIGINALITY

This is to confirm that the content of this thesis entitled "The Socio-technical Dynamics of ICT Innovation: A Social Shaping Analysis of Portals" is the result of original work and research of the author. Where concepts or ideas, other that those of the author are used, the reference to the original source is duly acknowledged and listed in the Bibliography.

GLOSSARY

CM	Content Management
DC	DaimlerChrysler
GP&S	Global Procurement and Supply department
GSP	Global Supplier Portal
ICT	Information and Communication Technology
IONS	Inter-organisational Networks and Systems
IT	Information Technology
MSID	Multi-level Space of Innovation Dynamics
OEM	Original Equipment Manufacturer
SST	Social Shaping of Technology
TM	Top Management
UI	User Interface

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Chapter 1. INTRODUCTION

1.1 Introduction

This thesis presents a longitudinal study of the dynamics of the innovation process in a case of a standardised technology – portals. During the last 20 years the business world has undergone significant changes. For some organisations, doing business globally has become critical to their survival, while others discover new opportunities by focusing their business at their local environment. In this process of change, Information and Communication Technology (ICT) plays a significant role in enabling and triggering the re-organisation of business activities. ICT has become ubiquitous, invading all aspects of the business domain. The fast development of the Internet technologies in the last 15 years has considerably accelerated the diffusion of Inter-Organisational Networks and Systems (IONS), and has intensified the collaboration (Venkatraman, 2000) between all kinds of companies, regardless of their size and type. Today, virtually all organisations' ICT systems are interconnected. IONS enables and organisation to arrange routine business transactions with all kinds of exchange partners ranging from suppliers and customers in the same value chain, to strategic partners and even competitors in the same or a related market (Turban et al., 2000).

Business-to-Business (B2B) Electronic Commerce (e-commerce) is often used interchangeably with the term generic term 'e-business'. Davydov (2000), for example, defines e-business as an all-encompassing concept of enabling the exchange of information and automation of commercial transactions over the Internet. Open technologies like XML were among the main drivers of the success of B2B e-commerce. Following Christiaanse and Rodon (2006), the real benefit of adopting XML-based technologies is grounded in a networked approach across companies and possibly industries. However, this inter-organisational integration calls for interoperability and therefore for compatibility standards (Markus et al., 2003).

Despite interoperability issues, increasing B2B e-commerce developments have triggered a massive increase in the number of IONS in the industry. Portals are one of the most prominent types of contemporary IONS (Turban et al., 2000). Definitions of a portal vary considerably in the existing literature; they range from the definition as an electronic platform with a single point of entry that enables collaboration through access to multiple sources of information (Turban et al., 2000), to portals as electronic gateways or access points and content aggregators, to hypertext links or other web pages collecting information (Neumann et al., 2006), to online hybrid or integrative business models integrating content, context, communication and commerce into one comprehensive business model (Bauer et al., 2004; Afuah & Tucci, 2001). Finally, according to Gounaris and Dimitradis (2003), portals can be characterised as integral problem-solvers following an augmented service concept.

Internet-based business portals are good examples of an increasingly globalised and networked world where ICT and e-business standards aim to ensure interoperability between different IT systems both within and between organisations. As ICT-enabled collaboration is becoming a decisive tool in the struggle for competitive advantage, interoperability has become a strategic necessity in all industries. Consequently, for seamless communication and integration of data and information, standardisation and harmonisation of ICT/e-business systems are required. They have gained strategic significance. However, in practice the development and implementation of portals and related processes and services turned out to be a challenging endeavour.

In this context, this thesis aims to contribute to our understanding of the dynamics of inter-organisational ICT innovations. This study specifically tries to answer theoretical and practical questions of ICT innovation dynamics in a complex multi-spaced setting, combining economic, technical and sociological theories and insights. In this study, the role of the socio-technical dynamics of a selected complex ICT innovation - a portal - is analysed following a 'social shaping of technology' (SST) approach. Such dynamics is viewed as patterning both the decision-making and the outcomes of complex ICT innovation projects. Attention is particularly drawn to the processes of aligning inter-organisational as well as intra-organisational interests of key players. The overall goal of this thesis is to apply the SST to systematically analyse technological change of a complex inter-organisational ICT system while adopting a historical, contextualised actor-focussed explanation.

More detailed, the goals of this thesis are:

1. First, to explore the dynamics of a complex setting of electronically mediated business relationships supported by IONS. Analysing the dynamics during planning, development and implementation of a supplier portal, this study aims achieve a better understanding of the complex relation between a new technology and the adopting organisation. I also address the fact that changes occur across the entire life cycle of standardised technology when a technology emerges in a particular setting and when it is diffused and further adapted to company-specific characteristics – Williams (1997) called this a 'biography of technology'.

2. Second, to explain and explore how these dynamics shape the outcome of a concrete innovation project, locally (between the organisations involved) and in the broader context of the industry sector. The strategic decision of a number of industry players to adopt a particular standardised technology may have important consequences for any organisation in that particular industry; for example, it might affect its boundaries by enabling interactions with a network of other participants. Thus, adoption of a particular standardised technology can generate complex interactions between the technology and the participating organisations, influencing their flexibility. In addition, there is evidence that outcomes of standardised technology projects deviate significantly from original plans and that such unexpected outcomes occur due to the particular dynamics of standard setting.

The established frameworks in the literature of ICT innovation do not adequately capture the phenomenon of dynamics of ICT innovations and of complex socio-technical setting. Therefore, a new analytical framework is called to offer a better understanding of these dynamics. To this end, a multidisciplinary approach has been chosen that integrates different theories in order to develop an analytical framework to overcome the shortcomings of the respective perspectives of each of the individual disciplines.

1.2 Motivation behind the study and research journey

The previous subsection provided an overview of the objective of this thesis. This subsection will explicitly describe the motivation and the research journey of the study.

The motivation behind this study is rooted in two major observations: first, the importance of analysing the dynamics of ICT innovations that shape the entire life cycle of standardised technology. A second observation is to overcome the limitations of existing literature regarding the analysis of the dynamics aspect as a significant component of the standardisation process. Therefore, the thesis seeks to develop theoretical explanations and to reach practical goals. The research is embedded in the interdisciplinary context of SST, organisational studies, and IT systems engineering. Driven by practical goals and a long professional experience in the automotive industry, my aim is to investigate the evolution of standardised portal technology, thus filling a gap in the research of the dynamics of ICT innovations.

1.2.1 Standards and standardisation

In an increasingly globalised world, corporations are focusing on closer collaboration within supply chains. As a result, development processes tend to become increasingly complex (Hanseth & Braa, 2000). Internet-based business portals are a good example of such an increasingly networked corporate world where e-business standards aim to ensure interoperability between heterogeneous IT systems. Frequently, such portals have been initiated by large buyers to improve interaction with their network of suppliers. Examples include General Electric's Trading Process Network and Boeing's PART marketplace (Turban et al., 2000). Other large user organisations have emerged as private consortia aiming to develop and implement *de facto* standards.

The major initial idea was to investigate ICT standards that underpin the emergence and diffusion of IONSs. From both an academic and a practical point of view, standards seemed to be a highly relevant topic. This view was reinforced through participation at the 3rd IEEE Conference on 'Standardization and Innovation in Information Technology' (SIIT) in 2003. Standards are a fundamental part of ICT, and are also playing a crucial yet dramatically underestimated role in daily life. Moreover, standards have opened up the field of technology and have thus enabled further innovation. Hawkins (1995) even claimed that throughout human history, the invention and application of technology has been accompanied by the development of standards.

Standards and standardisation are at least as complex in their own way as the technology to which they refer (Hawkins, 1995: 1). For the automotive industry, standardisation and harmonisation of infrastructures became of major importance in order to achieve the goal of a "networked industry". Standards and standardisation are at least as complex in their own way as the technology to which they relate (Hawkins, 1995: 1). For the automotive industry, standardisation and harmonisation of infrastructures became of major importance in order to achieve the proclaimed goal of becoming a "networked industry". Hence, the process of standardisation is an integral part of networked organisations. Therefore, I subsequently started to study ICT standards and standardisation related to IONSs, and tried to link it to the vast array of existing socio-economic literature and their related analytical frameworks.

Within this context, a definition of a standard and of the standardisation process is necessary to put the study in the right perspective. First, in a broad sense, a standard can be defined as *"a set of specifications to which all elements of product, processes, formats, or procedures under its jurisdiction must conform"* (Tassey, 2000: 588). David and Steinmueller (1994) differentiate between four categories of standards: reference standards, minimum quality standards, technical interface design standards, and compatibility standards. This study focuses on the latter category, i.e. standards that *"assure the user that a component or sub-system can successfully be* *incorporated and be 'inter-operable' with other constituents of a large system of closely specified inputs and outputs"* (David & Steinmueller, 1994: 218). Compatibility standards are addressed in relation to ICT as crucial enablers of information exchange between components within a particular system or between inter-organisational information systems.

Second, the standardisation process itself - the creation of a standard - includes the activity to establish and record a limited set of solutions to actual problems directed at the benefits for parties involved, balancing their interests and to be expected to be used over a certain period of time (De Vries, 2003), deliberately accepted by those parties having common interests based upon a quantifiable metric and influencing their behaviour and activities by permitting a common interchange (Cargill, 1989). Therefore, the development and implementation of compatibility standards does not only technically define a method of interoperation between the different components in a network, but most importantly represents a proposal for the future of complex socio-technical systems, i.e., the shape of inter-organisational networks. According to Graham et al. (1995), the standardisation process also represents an attempt to align interests, business practices and expectations of an array of people with an interest to develop and use the system to be standardised. Therefore, standardisation is not only about providing workable solutions but, most importantly, it refers to articulating and aligning expectations and interests (Williams, 1997).

As a result of these deliberations, during the course of the research its focus shifted from ICT standards to the standardisation process and its key actors who are situated in an arena of standardisation with different intertwined levels of analysis. The standardisation process turned out to be a process of intra- and inter-organisational alignment, shaped by the socio-technical dynamics of an ICT innovation.

1.2.2 Analytical frameworks to explain the standardisation process

A number of different analytical frameworks have been used in the existing standardisation literature to address the development and, less frequently, the implementation and use of standards. Thompson (1954) saw standards from an engineering point of view. Standard setting was seen as neutral, and the actors were seen as "interest free" engineers who collaborate in order to develop the best technical solution to a technical problem. In contrast, researchers such as Farrell and Saloner (1985, 1988) focused on a simple interest model where standard setting was seen as a game of power and dominance between the participants. The framework usually attempts to model the interplay between the interests of the actors (Farrell & Saloner, 1985, 1988; Cohen, 2003; Park, 2003).

The problem with these frameworks is the strong economic focus. Therefore, other researchers have used more sociologically-oriented frameworks to uncover the interactions between the social actors involved in the standard development. One example is the Social Shaping of Technology (SST).

The theory of SST conceptualises technology in general and standardisation in particular, as being shaped by an array of factors and actors. It aims to unveil the interactions between them and the way in which they shape the dynamics of a standardisation process and the respective outcomes (Jakobs et al., 1998). There are a number of SST empirical studies and analytical frameworks available; for example, the social shaping model of standard setting by Schmidt and Werle (1998). Standard setting is conceptualised as an actor network, and the focus of the analysis is on mapping the different relevant groups involved in the process (Schmidt & Werle, 1998).

Another theory investigating emerging standards is the Actor-Network Theory (ANT). The various interests of the actors involved are seen as negotiated constructs, forged in the process of alliance building. The actors involved (which, according to ANT, include humans as well as non-humans) try to translate their interests into the standard. Hence, the outcome of standardisation is seen as the result of a negotiation process. The process of technological change and its outcomes, and in particular the development of standards, is seen as locally constructed, negotiable and contingent. However, the framework has difficulties in accounting for the influence of prior history, and in taking for granted relations, routines and the broader context and structures (Graham et al., 1995; Spinardi et al., 1996; Monteiro & Hanseth, 1995).

In the area of standardisation, the 'development arena' is a concept that has emerged to theorise these interactions (Jørgensen & Sørensen, 1999). The development arena concept has enabled a multi-level analysis that encompasses the interactions between various actor networks involved in standards development (Williams & Edge, 1996; Sørensen & Williams, 2002; Jørgensen & Sørensen, 2002; Hwang, 2003).The development arena is a re-conceptualisation of the social shaping approach. The debates around the influence of the role of action versus structure, and that of particular actors, communities and the broader social milieu shaping technological innovation have provoked a rethinking of the social shaping perspective to better cover the complex interactions between a wide range of players in innovation, and across diverse settings (Sørensen & Williams, 2002).

Though often portrayed as a narrow technical matter, harmonisation and standardisation, especially in the realm of inter-organisational collaboration via standardised portal technology, are complex social processes shaped by an array of factors and embodying social relationships between the actors (Graham et al 1995; Egyedi 1996; Jakobs 2000, Egyedi &Loeffen, 2002). In this study not only are ICT standards ensuring interoperability of particular interest, but so too are 'best practice' standards incorporated in standard packaged solutions of web-based platforms such as portals (these are known as 'best practice industry standards'). As B2B e-commerce standards embody models of business processes they become process standards, extending beyond dyadic transactions into a choreographing of the interaction between the systems of business partners.

However, shortcomings were identified with regard to integrating multiple aspects of standardisation (Graham et al., 1995; Monteiro & Hanseth, 1995) such as the analysis of the entire standardisation life cycle. Many studies employ a static perspective and address the development process in isolation from the context of standards use. The challenge in fully analysing the standardisation process is to produce an adequate evolutionary account of the complex dynamics surrounding the entire life cycle of a standard.

SST-oriented theories and studies guided my research to unveil the interaction between the socio-economic factors that shape the standardisation process. Nevertheless, I still had to take into account the specific context within which the process took place (i.e., the fact that the case was based in the automotive industry which has long been characterised by mounting pressure for collaboration and cost reductions). The context turned out to be important in two ways: first, at the company level where political issues were surrounding the standardisation process, the nature of the technology and the social characteristics of the context within which the standardised technology was developed and implemented. Secondly, at the industry level within which the organisations investigated were embedded and linked through their supply chains or as IT service providers or vendors.

The setting of the case seemed to comprise two levels: the company and, secondly, the industry level where actors were driving the dynamics of the standardised technology. The case was initially located at the micro (company) level. However, the company was embedded into the industry context, the macro world. The portal technology represents the bridge between these worlds in a standardised way. From an IT vendor's or a technology provider's perspective, linking different actor worlds simplifies the need to offer a global solution. In practice, global solutions do not capture all local needs. There is no "one size fits all" solution. Consequently, tensions occur when global solutions are implemented in local environments.

Analysing socio-economic studies in standardisation, and particularly spaces or locales of which ICT innovations were part, I frequently came across the dichotomy of the 'micro' – 'macro' aspect of different theories. One of the strengths of ANT is its ability to address the dynamics of actor-driven scenarios in a micro environment; however, history and context are not considered. At the macro level, context and history-based studies included the broader meso aspect, but were limited to capture only key participants and the negotiation of their interests.

I felt that the diversity of the subject required an inter-disciplinary research approach, to understand the economic, social and technical aspects of the process. Hence, a literature review was conducted, with a focus on existing works in the sociology of technology and inter-organisational networks and systems, organisational studies, and economics and sociology of standardisation.

1.2.3 Unique access to a large project and personal expertise

This study is the result of more than six years of research in the area of e-business, and particularly in standards and standardisation. The longitudinal and contextual single-case study approach was chosen as it turned out to be an exceptionally detailed case with lots of information. During the project, I occupied a dual role as both actor and a participant observer. This had its benefits as well as its downsides. On the one hand, it offered a unique chance to get access to rich and valuable information and data. On the other hand, as an actor I was part of the system which framed my writing. For example, it was difficult to track some of the information sources. I cited sources wherever it was possible but had to carefully interrogate my commitment and position.

In addition, the long history of personal professional experience acquired in several large organisations as well as in management and IT consulting shaped a particular viewpoint. Since 1997, my expertise gained in procurement and logistics was complemented by electronic commerce and electronic business projects in various companies and industries. In most of these projects, standards and standardisation turned out to be an issue. Furthermore, standardisation issues occurred regardless of the life cycle phase the standard was in[1].

Within a standardised technology's life cycle, phases of stability and instability alternate. Moreover, interactions between the different phases can be observed, and different levels of standard dynamics can be identified. The characteristics of the context of use can be reflected in the approach to standard setting. For example, the development of standards is significantly influenced by the company-internal context of their use. It is a fact that a standard is not a static artefact but subject to change is

[1] A standard's life cycle can be characterised by different standardisation phases, starting with standards strategy, development, the implementation and use of a standard. During all phases, a standard changes, either it is developed further, e.g. in terms of new versions, appropriation, etc. or it is replaced by other standards (Williams et al., 2004).

termed 'dynamics of standardisation'. This dynamics is influenced and challenged by different groups of actors in the different standardisation environments.

1.2.4 Research questions

The Internet accelerated the diffusion of IONS, particularly electronic platforms such as portals to support the entire supply chain. Those platforms allow for communication and collaboration between organisations. However, to communicate and collaborate seamlessly, interoperability and harmonisation of systems are absolutely essential. Consequently, e-business standards and standardisation are part of every inter-organisational project and appear to bear a peculiar dynamic with major effects on the outcome of the project. Therefore, the thesis attempts to expand the understanding of the socio-technical dynamics patterning both the decision making and the outcomes of complex ICT innovation projects. It seeks to overcome the shortcomings of the existing body of social and economic research on inter-organisational standardisation.

To address the theoretical and practical goals of the study the following research questions were formulated:

1. What are the factors that shape the emergence of an inter-organisational portal strategy?
2. What causes the dynamics in developing and implementing a standardised supplier portal?
3. How do these dynamics pattern the outcomes? And how does local change take part in the wider context of the sector?

Those research questions initiated the study but changed slightly during the research towards a more sophisticated wording. In addition, the review of existing literature of different disciplines gave me a better understanding of the theoretical background. The subject under study itself did not change, and neither did the underlying meaning of the research questions. However, I gradually realised that the course of the research took a direction different from the one originally intended. At a certain point in time, the case revealed a dimension that I had not taken into consideration when I had started the study. First, there are the complex socio-technical setting and the context of the case, including the standardisation effort with an array of companies involved, supply chain relationships, a number of existing technologies in place, complex relations between technology supply and user organisations, and the complexities of inter-departmental and intra-organisational politics.

Secondly, in the very beginning I was not aware of the huge effects the socio-technical dynamics of the unfolding standardised portal technology would have on its outcome. The dynamics shaped and moderated the processes of its entire life cycle, its evolution and the outcomes of the project. Finally, the complexity of the case forced me to rethink theoretical frameworks of the different strands of existing literature that I had reviewed, and in the end I started to develop a new framework that helped me to present a simplified – yet still complex – picture of the world I found in practice. Additionally, it helped me to identify the different levels where socio-technical dynamics occurred and showed clearly that those levels are tightly intertwined. The Multi-level Space of Innovation Dynamics (MSID) framework developed can be seen as a theoretical contribution to research.

1.3 Research setting and approach

The case presented is an interdisciplinary and longitudinal study in the automotive sector comprising a combination of social, technological and economic theories. The different strands of research are linked together in order to achieve a deeper understanding of the dynamics of standards development and implementation of inter-organisational networks and systems.

Both external and internal triggers have driven car manufacturers to use standardised Internet technology to collaborate with component suppliers. Cost considerations led to scalable and consistent IT infrastructures with global access to all key infrastructure components, and to the reuse of technology across multiple projects and the replication of common solutions worldwide. Furthermore, the reduction of risks associated with the use of legacy technology (e.g. no updates available) and system crashes (out time) was also very much in the focus. The integration of all portal activities worldwide into one single portal was intended to reduce multiple sign-on as well as redundant data entries. Integration and the sharing of internal and external applications were seen as improving supply-network efficiency through system-driven workflows and alerts. Another goal was to provide a single user interface to the supplier community, and to gain access to a wider number of suppliers through the use of a standardised technology with the benefit of a shared marketplace infrastructure.

The automotive industry is a very interesting sector to look at. Typically, manufacturers here react to market pressure at an early stage, and can therefore be seen as a trend-setter in the manufacturing industry. The automotive industry is reshaped by tremendous technological changes, by enormous market pressure (McKinsey, 2003), and by extreme cost cutting. Constantly changing market requirements redefine the relations between original equipment manufacturers (OEMs) and their suppliers. The traditional arms-length relationship has been replaced by ever tighter collaboration.

In this increasingly globalised world, corporations are focusing on closer collaboration within supply chains and, subsequently, global processes have tended to become increasingly complex (Hanseth & Braa, 2000). According to Hanseth and Braa (2000), *"as corporations become more global, they become more integrated with each other and with distant local contexts"* (ibid: 50). This exactly describes the dichotomy. On the one hand, organisations aim for seamless global collaboration, but on the other hand the same organisations struggle to accept the global approach and ultimately adopt their existing local environment to a global solution.

Hence studies from a socio-technical perspective on the dynamics of ICT innovations are required to shed light on all aspects and processes projects that aim to ensure inter-organisational collaboration. Top managers and project managers of large-scale projects need a better understanding of the interplay between the technical and the social components, and to adequately do their project planning. For example, longer project times should be planned in order to permit alignment of actors' needs (e.g. functionality) or to allow for a better understanding of the management of expertise in terms of project staffing. Finally, project managers can interpret why original project goals might gradually move to slightly different ones or even to unexpected outcomes.

The review of existing literature was shaped by an interdisciplinary approach, integrating different strands of theory. A first overview of SST and organisational studies literature pointed to two basic concepts: Jørgensen's (1999) concept of 'arena of development' and the 'firm-in-sector' approach of Whipp and Clark (1986). Due to the course of the intellectual journey outlined above, these concepts were complemented by a third one: Ciborra et al.'s (2000) concept of drift. As this research also intends to contribute to theory, the idea emerged to overcome the shortcomings of the individual concepts as well as to explain the dynamics aspect by integrating established frameworks discussed in literature in order to build a new theoretical framework.

The theoretical framework developed applies the SST perspective to an analysis of the entire standardisation life cycle. This life cycle is characterised by a high complexity of the socio-technical setting, with a diversity of initiatives, and a variety of economic and social factors. The MSID framework attempts to analyse the dynamics of standardisation taking into account both the interaction between the actors involved and the context within which they operate. It consists of two components, the arena of standardisation and the dynamics within the arena. The former analyses the actors involved at two levels, the project level and the sector level. The latter is understood as a process of change resulting from the interactions of the actors across three dimensions: the context in which they operate the networks into which they are embedded, and the politics that characterise their actions. The framework seeks to shed light on the different stages of standardisation and on the issues of standardisation in the context of inter-organisational process integration.

The framework developed has been applied to a longitudinal large-scale single case study including the planning, the development and the implementation of a standardised portal in the automotive industry. The application of the model is intended to illustrate the way in which the abstract concepts of the model can be grounded in practice.

1.4 Structure of the thesis

The structure of the thesis shown in figure 1 is based on the research objectives and the research questions.

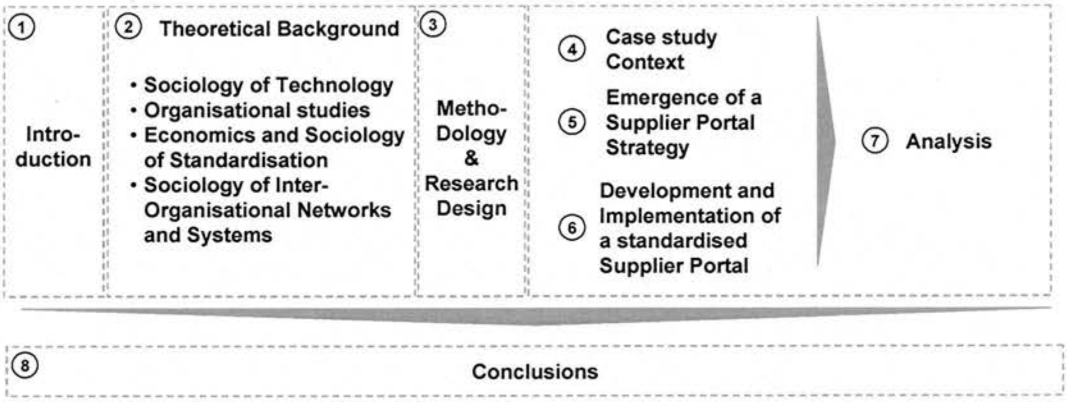

Figure 1. Overview of the PhD thesis

As illustrated in figure 1, the thesis will be subdivided into eight chapters. The first chapter 'introduction and motivation' defines the scope of the thesis and the research objectives.

The second chapter addresses the relevant theoretical background which comprises SST literature, studies of the sociology of technology and of IONSs, organisational studies and the economics and sociology of standards. Subsequently, in the third chapter the methodology that guided the research is described, and the basics of a new analytical model are suggested.

The next three chapters describe the case study in detail. Chapter four is laying out the context into which the case study is embedded. In chapter five, the pre-project phase that saw the emergence of the portal strategy is outlined, followed by a discussion of the development and the implementation of the standardised supplier portal, which is given in chapter six.

In chapter seven the analytical model is developed. It is based on the ideas outlined in the 'methodology' chapter and applied to the case. Subsequently, the research findings are analysed. Finally, in the last chapter the findings of the study are reflected upon, theories used and limitations of the research design are identified. A list of areas of further research concludes the thesis.

Chapter 2. THEORETICAL BACKGROUND

2.1 Introduction

This chapter reviews a range of existing literature relevant to the study. The relationship between technology and organisation and the associated negotiations can be conceptualised in many ways. Mainstream literature of Management of Technology underpins the widely shared belief that IT is the crucial factor of organisational transformations. However, this is not sufficient to explain transformations and their outcome because there is a need to exactly analyse how IONS shape, enable and constrain organisational changes (Monteiro, 2000).

The theoretical background covers existing literature from different strands of research in order to ensure the necessary multidisciplinary approach. This chapter is structured as follows. In the next section, two key strands in Sociology of Technology analysing the 'Technology – Sociology' relationship are briefly presented: the concepts of Social Shaping of Technology (SST) and Actor Network Theory (ANT). The subsequent section about organisational studies looks at research in technological innovations and work organisations, and how technological change meets organisational processes and politics. The sociology of standardisation section starts with existing research on standardisation, followed by a definition and taxonomy of standards by the standard setting and then identifies the shortcomings of existing research. In the last section, socio-economic research on IONS is reviewed. Based on business relationships, an overview of IONS is given and the role of portals as IONS is discussed. The final subsection concludes this theoretical background chapter with a discussion of standardisation issues of IONS.

2.2 Sociology of Technology

2.2.1 Social Shaping of Technology

The Social Shaping of Technology (SST) perspective taken in this thesis emerged from a shift in social and economic research on technology that explores and analyses both the content of technologies and the processes of innovation

(MacKenzie & Wajcman, 1985; Bijker & Law, 1992; Williams, 2004). During the 1980s, the study of technology was undergoing an expansion and transformation: the relation of technology and society was reconsidered and the conventional assumption that technological change is subject to a purely technical logic or economic imperative was argued (Dierkes & Hoffmann, 1992: 9).

SST[2] has emerged through a critique of the dominant rhetoric of technological determinism which portrayed technology as a vehicle for achieving organisational change, without taking into consideration the difficulties in implementing technologies, as well as their frequent failures to deliver predicted and desired outcomes. More precisely, technological determinism is characterised by the notion that (1) the nature of technologies and the direction of change is without problems and pre-determined and (2) that technology has a determinate 'impact' on work and economic life and the entire society. Consequently, technological change is responsible for social and organisational change (Williams & Edge, 1996: 868). Mainstream literature of management of organisations or of technology tends to take technology for granted and as an instrument precisely defined (Clausen & Koch, 1999). In contrast, SST studies focus on the choice and decisions, in defining features of the technology as a process, 'spanning occasions and spaces' (Clausen & Williams, 1994; Clausen & Koch, 1999). SST includes different approaches and concepts that attempt to demonstrate and analyse the political, economic and cultural interests and values that influence the direction of technological change (Russell & Williams, 2002; Sørensen, 2002).

In this context, MacKenzie and Wajcman (1985) pointed out that, "[t]echnology has at least three different layers of meaning: if refers to physical objects and artefacts embracing material and non-material components, to systemized and tacit knowledge, and to activities and processes" (MacKenzie & Wajcman, 1985: 3-4; Dierkes & Hoffmann, 1992). The concept of 'choices' is central to SST. These are not necessarily conscious choices, though; they are inherent in both the design of

[2] Williams and Edge (1996) reviewed some of the differences within this broad church, for example ANT and social construction of technology (SCOT). It is not the primary goal of this thesis to explore the different claims of these various schools.

individual artefacts and systems, and in the direction or trajectory of innovation programmes (Williams & Edge, 1996: 866). Those choices occur at every stage during the development and use of a technology or a standard; a number of technical choices are available to the actors involved. The way in which the stabilisation process occurs through interest alignment and translation, and the gradual limitation of the technology's interpretative flexibility until it reaches the point of closure depends on the particular choices that actors make during negotiations. Such choices depend on a number of social, technical, economic, organisational and political factors. SST studies aim to unveil the interactions between these factors, the way in which they shape the technology and their outcomes on the innovations processes (Jakobs et al., 1998; Williams & Edge, 1996).

Technology does not emerge in a pre-determined way; different routes are available and might lead to different technological outcomes with different implications for individuals or the society (Williams & Edge, 1996). Thus, SST research investigates the ways in which social, institutional, economic and cultural factors have shaped (1) the direction and the rate of innovation, (2) the form of technological artefacts and practices and (3) the outcome of technological change (Williams & Edge, 1996: 868). Researchers in the SST field argue differently when analysing social influences over different technological routes taken and their respective impacts in terms of two sets of questions:

(1) The negotiability of technology and the respective 'technological' and 'societal' outcome (Cronberg, 1992), and

(2) Questions about irreversibility; the extent and the way in which choices may be foreclosed (Collingridge, 1992; Callon, 1993). Certain new technologies may displace established ones or 'lock-in' to established solutions (David, 1975; Arthur, 1989; Cowan, 1992). SST also points to closure, the way in which innovations become stabilised (Pinch & Bijker, 1984), or the possibility to reverse earlier choices (Latour, 1988), (Williams & Edge, 1996: 867).

As illustrated in the paragraphs before, different approaches have influenced SST. These approaches stressed that both form and content of technology are important and require social analysis (Williams & Edge, 1996: 873).

(1) They focus on, and discuss from different angles, the problems of the innovation process. It is claimed that innovation is a contradictory and uncertain process not just about the rational-technical problem-solving, but also including economic and political processes. Alliances of interest are built up between potential users and suppliers around certain visions of unrealised technologies. Examples of frameworks have been described as building of socio-technical systems (Hughes, 1983), socio-technical constituencies (Molina, 1989), or socio-technical ensembles (Bijker, 1993, 1995), or as creating and mobilising an actor network (Law & Callon, 1992) (Williams & Edge, 1996: 873).

(2) The innovation process is typically characterised by imperfect knowledge and bounded rationality (ibid). Technological success is not depending exclusively on money but also on the flow of information between experts and other groups who have differing perspectives and knowledge bases that are needed to create new technologies (Fincham et al., 1995). To enrol other actors such as competing suppliers, for example, can cause problems and has to be balanced between cooperation and competition (e.g. Howells & Hine, 1993). It is also claimed that the shaping process starts with the early stages of research and development which consequently leads to the fact that inventions at least are partially an unpredictable process (Williams & Edge, 1996: 873-874).

One of the important notions of SST is the idea that technologies are situated in an organisational environment. In this micro setting, technology is directly shaped by the actors involved as well as by the players situated on the meso level, such as the sector. SST claims that:

- Technology is produced and used in particular social contexts, and the processes of technological change are often social rather than simply driven by technology
- Technology consists of an immediate setting of knowledge, use practices, skills, meanings and values, problems and purposes
- Technology often operates in socio-technical systems or configurations
- Technological change is always part of a socio-technical transformation which means that technology and social arrangements are co-produced in the same process (Russell & Williams, 2002: 48).

A distinction in terms of features and categories and their applicability in organisations is useful in order to differentiate the deployment of technology that is situated in different organisational environments and to avoid 'over-generalisation'. Fleck (1988) distinguishes categories of discrete, component, system and configurational technologies. This kind of distinction facilitates an analysis in identifying differences, for example between specific systemic or configurational applications that is of importance when studying complex technologies such as portals.

Strongly related to the socially situated notion of technology as systems or configurations is the study of appropriation and use of technological innovations when these systems or configurations have been implemented in organisations and are used in the daily work. However, the SST research was simultaneously inspired by the early accounts of Actor Network Theory (ANT).

2.2.2 Actor network theory

Another analytical tool is the Actor Network Theory (ANT). ANT is rooted in the interdisciplinary field of science and technology studies (STS) (Monteiro, 2000) and was developed by Callon, 1993; Latour, 1991; Law, 1991; and Akrich, 1992. ANT is an approach to overcome the shortcomings of modern social science. Core elements of early ANT accounts include strategies and actions of a central actor, a system builder or a heterogeneous engineer (Russell & Williams, 2002). Those central actors *"attempt to marshal resources necessary for a project, particularly by enrolling other actors – locking them into appropriate roles – and appropriating the right to* *speak for them"* (ibid: 41). An actor network is an emerging and increasingly stabilised network consisting and linking both technical and non-technical elements (Monteiro, 2000). It takes shape by negotiation of the interests of involved actors. Heterogeneous in nature, an actor network is free of hierarchies and has developed a particular vocabulary to describe the negotiation processes (Russell & Williams, 2002; Monteiro, 2000).

One of the strengths of ANT is its ability to analyse the dynamics of actor-driven scenarios. In this respect, Callon's concept of irreversibility of an aligned network describes the strengths of competing inscriptions in terms of the durability of an actor network (ibid). Within ANT, the 'black boxing' perspective impliess to neglect to distinguish a priori between small and large networks. Consequently, there is no distinction between micro, meso and macro level of analysis: ANT offers one uniform framework regardless of the unit of analysis by *"providing a uniform framework in connecting the local and the global to identify the local in the global and vice versa"* (Monteiro, 2000: 81). Analytically, it is difficult to apply the ANT framework to examine case studies related to the 'local-global' discussion is the approach of ANT to use micro structures (for example an R&D laboratory) due to the fact that ANT extrapolates micro structures to macro environments. This theoretical approach has been criticised for its one-way bottom-up modelling of society (Russell & Williams, 1988:1), failing to acknowledge that not every macro environment can be explained by micro processes.

In their TSR2 study, Callon and Law (1991) have acknowledged this shortcoming and attempted to bridge the gap between the micro and macro levels using an actor-network template. Although the template vocabulary includes concepts such as 'global' and 'local' network and the 'obligatory point passage' linking them, it does not incorporate the actors' decision-making processes. Yet, these processes are often shaped by the pre-existing history and the context into which the networks are embedded (Russell & Williams, 1988). Callon and Law (1991) also suggest that the network itself can be expanded unlimitedly.

ANT has been increasingly used by IS researchers to examine IS in a case study setting (for example Graham et al., 1995; Bowker et al., 1996; Hanseth et al., 1997; Monteiro & Hepso, 2000; Fomin, 2001). However, it has been recognised that information infrastructures consist of both local and global characteristics (Monteiro, 2000). Information infrastructures consist at the same time of micro constructs such as detailed formats or patterns of local use, and of macro aspects such as the existing infrastructure or the fact that it is cutting across local contexts (Monteiro, 2000: 80). Consequently, flexibility in the granularity of analysis is required to describe and analyse information infrastructure (ibid).

In summary, ANT accounts have been helpful in uncovering the role that micro social processes play in shaping specific technologies. However, this focus meant that ANT studies have been trying to explain society by extrapolating from micro-processes, and have rejected work that deals with broader social structures (Russell & Williams, 1988:1). Likewise, these studies have neglected pre-existing history and context, which they see as emerging from the actions of actors within the network. To address these shortcomings we argue that a new theoretical framework is needed. This new framework builds upon ANT, while also incorporating concepts of the broader SST research and organisational studies in order to analyse the case at hand by integrating the local and the global level, the pre-existing history as well as the industrial context (see section 3.3.2).

The micro – meso aspect had been the focus of attention and led to developments in Social and Technology Studies (STS).

2.2.3 Developments in Social and Technology Studies (STS)

The locus of technology innovation - the 'micro' – 'meso' - has received a much attention in recent social studies of technology. For example, Clausen and Koch (1999) are talking about social spaces and a complex array of players with different perspectives and resources to describe important locations of transformation. Clausen and Koch (1999), in their study of the social shaping of ERP systems in Danish manufacturing, examine the role of "spaces and occasions" in technological transformation of IT. From an SST perspective, they focus on decisions and choices that have to be made to shape technology. Accordingly, decisions and choices are made through negotiations among diverse and heterogeneous players who are involved in the relevant social processes.

However, Clausen and Koch claim that a comprehension of technological choice as being 'social' is not enough. There is a need for understanding how, where, when and under what circumstances the choice is taking place (Clausen & Koch, 1999: 463-464). Consequently, the authors attempt to identify contexts and frameworks as spaces or occasions within which a technology is negotiated and choices are made. Additionally, Clausen and Koch also emphasise the political character of these negotiations as the heterogeneous players involved pursue diverse interests. Therefore, they argue that a space for shaping implies a social context, where socio-technical ensembles can be addressed and politicised (Clausen & Koch, 1999: 465).

By examining the social choices involved in the development and transformation of ERP systems in the Danish context, Clausen and Koch identify and examine three spaces and occasions that emerge as important in terms of shaping of the technology. These also reflect different occasions in the transformation of IT systems. Their analysis showed very useful results regarding actors' strategies, the instability or stability of their relations as well as the dynamics of the market in relation to the process of shaping of Enterprise Resource Planning (ERP) systems (Clausen & Koch, 1999: 479-480).

One instance of the 'SST-ANT' dialogue is the concept of the 'arena' developed by Jørgensen (1999) that is applied as part of the framework developed in the thesis (see chapter 3). The overarching concept of "development arena" proposed by Jørgensen and Sørensen (1999) aims to capture key participants and features of particular contexts of innovation. This concept of a special innovation development space is characterised by a population of actors and artefacts, and by the relationships between them. As the 'arena of development' is part of the framework, a more detailed description is available in section 3.4.1.

After the review of SST and ANT, another strand of existing research - organisational studies is briefly presented.

2.3 Organisational Studies

Parallel discussions within organisational theories led to an array of organisational studies seeking to analyse the technology – organisation relationship more specifically. In the context of ICT, Inter-Organisational Networks and Systems (IONS), together with the Internet, have emerged as perhaps the key technological developments of the twentieth century (McLoughlin, 1999). In this context, the account of the broader term of IONS has gained importance as it comprises not only the technological but also the socio-political aspects. Those socio-technical ensembles or socio-technical configurations (Bijker, 1993) are shaping intra- and inter-organisational processes of companies, and are understood as 'electronic mediation of human interaction and the embodiment of business communication and activity in the realms of cyberspace' (McLoughlin, 1999: 1). Moreover, it has to be recognised that IONS increasingly underpin the transformation of organisations (ibid) and enable, for example, concepts such as 'lean production' (Womack et al., 1990) or 'business process reengineering' (BPR) (Hammer & Champy, 1993) and 'business network redesign' (Short & Venkatraman, 1992). Portals are IONSs and technological innovations that enable organisations to mediate their relationships with business partners electronically. Accordingly, those work organisations extend their boundaries with the help of technological innovations and are part of larger networks.

2.3.1 Technological innovation and work organisation

The term 'technological innovation' has been defined in many different ways (Roy, 1986; McLoughlin & Harris, 1997), and studies of innovation have focused on different levels of analysis (Slappendel, 1996) depending on the school of thought and the purpose of the analyst. Burns and Stalker (1961), for example, understood innovation or invention, and new technology-based product or production processes synonymously (Burns & Stalker, 1961). Economists or innovation theorists, such as the frequently quoted Freeman (1982), have defined technological innovations as an event when the innovation is commercially applied in a new process or product (McLoughlin & Harris, 1997).

Technological innovations are inextricably intertwined with the relationship between 'the new technology' and its adoption in organisations or, more precisely, the nature of the process of technological innovation and the organisational change which is related to the new technology. The attempt to review and develop an analytical understanding of the relationship between technology and organisation has to struggle with the issue of the independent influence technology has in shaping organisational behaviour and the organisational outcomes of technological change (McLoughlin, 1999: 4).

Depending on the school of thought (i.e., organisational theory, innovation studies, evolutionary economics or the social shaping of technology, etc.), topics surrounding innovations, particularly the ways of evaluating the interaction between technology and organisations, are framed and understood differently (McLoughlin, 1999). However, each of these concepts has its strengths and weaknesses in framing the relationship 'technology-organisation'. The common topic in most of the literature, especially amongst sociologists of technology, is the 'overriding concern' of 'technological determinism'. Therefore, the critique of technological determinism can be seen as the starting point to re-define technology in the sense of including the social context and the effects technology has on organisations and outcome during the adoption.

However, Orlikowski (1992), with an ANT-centred approach, found that research on how to model the relationship between technology and organisation remains 'ambiguous and conflicting'. Furthermore, she noted that *"the divergent definitions an opposing perspective associated with technological research have limited the understanding of how technology interacts with organisations. What is needed is a reconstruction of the concept of technology, which fundamentally re-examines the current notion of technology and its role in organisations"* (Orlikowski, 1992: 398).

Strongly related to the relationship between technology and organisations is the area of organisational politics and processes.

2.3.2 Organisational politics and processes

Organisational politics and the processual understanding of organisations

Organisational politics and a processual understanding of socio-technical innovations started when Simon (1957) criticised normative management for its perfect and rationalistic view and suggested to replace the classical theory by a model of bounded rationality which begins to emerge when situations are examined involving decision making under uncertainty and imperfect competition (Simon, 1978).

The political dimension is understood as another driver of change. In adopting this perspective, change is viewed as a complex dynamic process shaped by powerful conditions, by the nature of the change programme and by the history and context within which change takes place (e.g. Burns & Stalker, 1961; Clausen & Koch, 1999). Burns and Stalker (1961) introduced the concept of structure and organisational politics. Their innovation research, "The Management of Innovation" (1961), was a study of large established Scottish firms. In their study of 20 British firms operating in the electronics and fibre industries, Burns and Stalker (1961) have found that a particular type of "organic" organisation outperformed the mechanistic type's capacity to innovate. In contrast, mechanistic organisations are characterised by formalisation, job specialisation, hierarchy, and top down communication.

Whipp and Clark (1986) introduced the notion of the 'organisational repertoire'. This consists of the company-specific knowledge to coordinate everyday activities, activities associated with change and activities undertaken in response to special situations (Clark, 1987; Edwards, 2000: 451). Depending on the situation, an organisation will adopt differing 'poses'. For example, when an organisation orients its adaptive capability towards future problems, it is likely that this organisation will adopt an innovation pose in conjunction with its basic operating pose (Clark & Staunton, 1989: 185). The introduction of an innovative product or process may transform the existing basic operational pose of the repertoire. However, change in the repertoire through innovation is uncertain and is not guaranteed (Edwards, 2000). New practices may be compromised due to resistance, or may be problematic because of the absence of necessary knowledge. Consequently, transformational change is dependent on showing how the existing features of the repertoire expressed through a particular operational pose embedded in the organisations social and economic context provides the means to undertake these new activities (ibid: 452). Thus, it depends on how an organisation can deal with uncertainty, which skills, normative frameworks and knowledge exist, and to which extent innovation is unpacked. 'Organisational innovation and the transformation reflect the appropriation of an innovation 'template'. The notion of template is used to incorporate a special case of situated practice (ibid). Clark and Staunton (1989) understood those templates as the embodied knowledge of a company. They are playing a significant role in the evolution of innovations as dynamic configurations dealing with the appropriation of administrative innovations (Clark, 1996).

In the context of a dynamic interactive process perspective, Clark (1987) moved away from the technical rationalistic model of moment to a processual view and noted that individuals are influenced by pre-existing structures which empower them to interpret events in the future. He further stated that structure and agency presumes that individuals learn a collective repertoire of cognitions, normative frameworks and behavioural patterns (Clark & Staunton, 1989). In this context, innovation is understood as a reflection of continuity and a modification of the rules and resources that mediate the outcome of human conduct in an organisational setting (Edwards, 2000). Hence, the innovation process represents the intersection of structures of signification, legitimacy and domination which are part of a network and social relations within organisations. These, in turn, are also part of the environment of a historical and cultural system, as well as part of a broader political context (Jones, 1997: 17).

As a response to Fordist and Post-Fordist models of technological and organisational change, Child (1972) offered an alternative framework including the notion of strategic choice (McLoughlin & Harris, 1997). Child linked an actor-centred account with the context in order to better understand organisations decisions. The framework highlighted the key role that is played by organisational politics and different actors' interests in shaping the organisational outcome of technological change. External factors were regarded not as influencing, but rather as contextual referents for decision makers (McLoughlin & Harris, 1997: 9). Apart from Child, other researchers such as Wilkinson (1983), Boddy and Buchanan (1983) or Dawson (1994) conceptualised technological change as a process.

However, this approach has been criticised insofar as the process perspective is preoccupied with processes. It therefore separates the technical-organisational change issues from the broader structural context and, as a consequence, outcomes tend to be explained in highly localised 'idiosyncratic' terms (e.g. Reed, 1985; McLoughlin & Harris, 1997: 10). The management of change driven by technological innovations thus plays a key role within organisational studies.

The management of change in organisations

Despite the criticism, processual models of change aim to explain the political nature of management decisions, and include the history of the decisions taken and their social construction by those who took them (Dawson, 1994). In contrast, Buchanan (1994) argued that process models are failing to improve our understanding of the management of change. The complexity of change cannot be explained by what Buchanan and Storey (1997) called 'listology', due to the complexity of the organisational change itself and its outcome. However, the process perspective provides the opportunity to reconsider the role of change agents and the effectiveness of change management programmes (McLoughlin & Harris, 1997).

In the area of key elements guiding successful management of change, a number of researchers such as Schon (1963) or Rothwell and Robertson (1973) have focussed on the particular role of change agents, product champions, sponsors or business innovators. Rothwell and Robertson (1973) even distinguished different roles in different stages of a change project such as technical and business innovators, chief executive or product champion. Along the same lines, Tidd et al. (2005)

distinguished key players in the entire process who hold several different roles, for example technical champion, organisational sponsor, or technological gatekeepers. The technical champion is the inventor or team leader with a deep technical understanding of the technology behind the innovation (Tidd et al., 2005: 479). Organisational sponsors believe in the potential of the innovation, but they do not posses detailed technical knowledge. Instead, their role consists of attending to resource requirements along with placating sceptics and hostile critics of the project. They require the power and influence to 'pull the various strings of the organisation (Tidd et al., 2005: 482). The technological gatekeeper collects information from diverse sources and passes them to the relevant actors in an organisation who might be interested to use the information (Tidd et al., 2005: 483). This is not always formal, and may well also take into account the political dimension.

Political processes of change management include different types of power, e.g. overt or covert in nature, or power of expertise (Dawson, 2000; French & Raven, 1993). Murray (1989) noted that decision-making around the use of a technology involves mobilisation of organisational power (Dawson, 2000). Accordingly, outcomes are rather reflecting the battle of interests of the different social groups than rational behaviour (Dawson, 2000). Change programmes implemented in a given context need to coordinate resources and therefore fit in the flexible organisational form of a project. A project is defined as a temporary endeavour undertaken to create a unique product or service. 'Temporary' means that the project has a definite end date, while 'unique' means that the project's end result is different than the results of other functions of an organisation (Kitz, 2004). In this context, the creation of a project team is a specialised exercise in matching expertise as well as personalities to deliver a service or design or improve a product (Bryson & Rusten, 2004). Project-based teams are usually involved with new knowledge creation or the application of existing knowledge to a particular situation.

Interpretations are playing a key role in communication and collaboration in socio-technical projects, depending on the power and the positions pursued by different social groups. In order to secure a preferred outcome, they try to mobilise different 'configurations of power'. During the course of socio-technical projects, actions and

interactions contribute to the evolution of an outcome. Therefore, the concept of 'boundary objects' is useful to incorporate a multiplicity of meanings and to facilitate communication and collective work in a project (Garrety & Badham, 2000).
The conceptualisation of the political process of change, including elements of conflict, resistance, decision or non-decision activities, processes of negotiation, and the internal and external mobilisation of power sources by social groups or individuals, allows for the pursuit of preferred outcomes. Design and use of technology are likely to be modified and challenged collectively by participant actors involved in the implementation (Dawson, 2000). Based on competing histories, 'the process of change is continuously shaped by an interplay and conflict between historical reconstructions, current contextual conditions and future expectations' (Dawson, 1996: 26), depending on the power and the situation of the different social groups. Consequently, the political process of change is accompanied by the management of expertise gained for example by individuals from change projects who hope to develop further their individual career.

The management of expertise and individual career development

In social sciences, the concept of expertise has been studied by researchers on a more general level of management of expertise (e.g. Fincham et al., 1994; Fleck & Tierney, 1991) and on a more detailed level of individual career development (e.g. Williams & Procter, 1998); Heimer, 1984). Fincham et al. (1994), for example, attempted to reassess existing approaches in single disciplines such as technology management, computer sciences or organisation theory. The objective of this research was to develop an integrated account in order to enhance the understanding of companies and their industry context linked with the character of IT, and the methods by which IT is designed and implemented. Existing studies on organisational politics and decision-making tend to focus on networking and knowledge utilisation (Hislop et al., 2000); or on the management of expertise both in terms of power and on its knowledge aspects (Fleck & Tierney, 1991).

Fleck and Tierney have already pointed out that expertise is the intersection of individual career trajectories and institutional structures such as the job position an individual hold within a department. In their study (1991) they reviewed the concept of technical expertise and its management in terms of power and knowledge. The authors claimed that expertise is situated and embodied, continually renegotiated amongst social groups. Its representation is done by the intersection of individual career trajectories with institutional structures such as for example specialist technical commitments (Fleck & Tierney, 1991: 2). The authors draw attention to different knowledge levels where expertise is operated and how those sets of knowledge may be carried by groups who use this expertise to increase their power.

Related to the management of expertise and to project work, some researchers have analysed individual career development. Heimer (1984) specifically explored the issue of individual control over career development in project work because in these settings, control over careers is particularly problematic. According to Heimer, control over a career means control over a series of elements determining whether individuals' abilities are developed, if this development is noted and recorded, and if this person has access to external job information and potential employers have access to information about the person in question. In her study she analysed how individual's capacity for human capital development is constrained by organisational policies and larger forces. She claims that no one can control a career as such and that career development depends on a series of factors, some of which facilitate individual control and others of which facilitate organisational control (Heimer, 1984). Williams and Procter (1998) found that the patterns are not only the result of individual's functional roles or of management strategy. Moreover, it found that roles are constructed both through bottom-up and top-down strategy as individuals pursue their own occupational and organisational interests. Expertise is not only constructed but also validated through a two-way interaction in hierarchies and may lead to an expert reputation or higher status as well as to conflicts of access to power and resources (Williams & Procter, 1998: 197).

The next area of existing research reviewed is based in the field of economics and sociology of standardisation.

2.4 Economics and Sociology of Standardisation

2.4.1 Existing research on standardisation

Some of the earliest accounts of standardisation are made by economic historians. Thompson's (1954) study, for example, describes the evolution of technical standards in the automotive industry up to the 1930s. He attempts to explain the relationships between economic conditions and technological evolution by identifying the economic advantages that have encouraged the standardisation efforts in the industry as well as the economic and technical considerations that have deterred the process. Standard setting is seen as neutral, and the actors are seen as "interest free" engineers who collaborate in order to develop the best technical solution to a technical problem.

However, the dominant perspective in the social science analysis of standardisation has been economic. The choices for users between competing standards and the choices between alternative standardisation processes have both been fertile areas for academic economists. Economic models have been used to study the process and effects of market-driven standardisation (Farrell & Saloner, 1985; 1986; David, 1987; Katz & Shapiro, 1986) to compare different forms of standard settings (Farrell & Saloner, 1988; Genschel, 1997) and to analyse the factors affecting the firm's choice between the standard settings available (Besen & Farrell, 1994).

The economic literature has extensively applied Arthur's (1989) analysis based on network externalities, increasing returns, switching costs and lock-in to explain the effects of standardisation – particularly market driven standardisation – and the danger of lock-in into an inferior standard (David, 1985; Farrell & Saloner, 1985; Katz & Shapiro, 1986). However, Farrell and Shapiro (1988) find that switching costs can promote entry as they encourage entry to serve unattached users. David and Steinmueller (1994) and Swann (2000) provide a comprehensive review of the pro- and anti-competitive effects of standardisation including lower transaction costs and entry barriers and but restriction on innovation and inducing predatory pricing behaviours.

Economic research conceptualises the process of standard creation within standard setting bodies as an "interactive co-operative behaviour of learning agents within clubs" (Antonelli, 1994, 197). The focus is on the firm's choice between alternative forms of standard settings which is based on efficiency criteria and it is analysed employing game theory (Belleflame, 2002; Besen & Farrell, 1994; Farrell & Saloner, 1988; Genschel, 1997). In general, the economic argument goes that committee standardisation, i.e. standardisation within standard bodies, is more efficient but slower than market standardisation (Farrell & Saloner, 1988). Standard setting is seen as a game of power and dominance between the participants. The framework usually attempts to model the interplay between the interests of the actors.

With the significant increase in the number of standards bodies during the mid 1980s and 1990s, the focus has moved towards the analysis of the different types of standard settings outside the market realm. Similar to the technocratic ideology account, the participants in the standardisation process are seen as collaborating towards the development of the best technical solution. However, standard setting is seen as following specific rules and procedures in order to ensure that standards emerge through a democratic process (e.g. due process, fairness, transparency and openness, consensus, voting system).This body of research suggests that the formal official Standards Developing Organisation (SDOs) are characterised by a number of principles that support a technocratic approach to standardisation (standards are free from the political interests of the participants and represent the best solution to a problem), but lead to slow and cumbersome standardisation (Besen & Farrell, 1991; David & Shurmer, 1996; Swann, 2000). In contrast, such studies maintain that private consortia are more flexible and faster as their membership, internal procedures and rules can be tailored to specific tasks (David & Shurmer, 1996; Hawkins, 1999).

Political theory researchers have adopted the economic arguments and have analysed the evolution and characteristics of the various forms of standard setting bodies. Such studies suggest that choice between different forms of standardisation has to take into account standard settings bodies' characteristics such as the cost of vote recruiting, number of actors and procedural mechanisms (Austin & Milner, 2001; Weiss, 1993). Political theory has also been applied to understand the political process through which standard setting emerge (Nicolaodis & Egan, 2001; Pelkams, 2001). The economic account has also pervaded the law literature that focuses on the connections between standardisation and intellectual property rights (Smoot, 1995).

While undeniably relevant for the analysis of competing platform standards, for example the legendary standards wars between video formats, the economic analysis is less relevant to (the implementation of) e-business and e-government standards. This is also evidenced by the lack of references to the economic analyses of e-business standards in two thorough overviews of the economics of standards (Blind, 2004; Swann, 2000). For example, an economic analysis can contrast the benefits of an e-government system over no system, but it struggles to explain why the implemented standards took on the form they did. All the economic models of standardisation are based on the fundamental assumption that the actors involved in the standard setting process are seeking economic benefits. A critical variable in the game theory and governance decision analysis models is the payoff for the firms involved, where payoffs represent economic returns (Besen & Farrell, 1994).

The crucial role that standards play for ICT development, especially in relation with technological innovation processes, has been documented in the socio-economic literature on standard development. Standardisation has been found to have a major impact on technology innovations (Jakobs et al., 1998), to represent an endogenous factor that shapes technology development (Egyedi, 1996), and to affect the rate and direction of innovation (David & Steinmueller, 1994). A growing body of literature has thus emerged investigating the factors shaping the standards development process and its outcomes.

However, there are some analytical challenges and shortcomings evident in this literature. For methodological, practical and theoretical reasons, many socio-economic studies of standard development have involved case-studies of particular instances and fora for the agreement for a particular standard, and focusing on the interplay between the various interests involved in relation to a particular standard. I argue that such a static focus has restricted the ability of existing socio-economic analytical frameworks to conceptualise and fully investigate the ongoing relation between the various stages in the standard life cycle and dynamics between those stages including their evolution during development and implementation.

The reasons for these shortcomings in existing studies of standardisation are various, and include practical considerations (for example resource constraints mean that direct investigation of standard setting contexts is limited in time and social/geographical space) as well as the prevalence of actor-centred accounts within many contemporary technology studies (which, with their concern to explore the influence of actors on standard development, have tended to focus on the immediate locales of standard setting) (Williams, 1997). I suggest that the framework of analysis has to be enlarged in order to account for a dynamic evaluation of standard development and implementation.
The aim of the thesis is to define a more complex conceptual framework that can address the dynamics of standards as they evolve over time.

Compatibility standards are addressed in relation with network ICTs where they are crucial in that they enable data exchange between components within a particular system or between different inter-organisational information systems (Bunduchi, et al., 2004). Therefore, compatibility standards such as ICT standards are the focal point of research. There is a great volume of literature focusing on ICT standards and standardisation, quite often economically or technically driven, and only sometimes addressing the social perspective.

In general, standards serve to reduce diversity and to create a certain order and compatibility, but there is usually a complex matrix of standards at different levels: in ICT, standards are embedded in applications, systems or platforms and thus provide a mixture of constraint and autonomy. A standard often relates to one component only, or describes a particular interface between systems in order to ensure interoperability. A standard typically permits different ways of building technologies around it and influence in a distinct way the application and use of ICT (Russell & Williams, 2002). Standardisation is claimed to be an important form of 'alignment and stabilisation' and can be seen as a constant competition among visions and interests of different actors (e.g. Law, 1986; Fleck, 1988; Cowan, 1992).

The social processes that underlie the standardisation process are excluded from the analysis. Economic theory explains why standardisation takes place within committees rather than other forms of standard settings, and why such committees exist. However, the exclusively economic focus restricts the ability to explain how these committees are organised and how actors are enrolled. To address the rich social processes that characterise the standardisation process and which cannot be captured in an economic account, standardisation researchers have increasingly adopted social constructivism and institutional theory (Schmidt & Werle, 1993; 1998) or social theories such as social shaping of technology (Graham et al., 1995). SST conceptualises technology as a social product, which develops not according to an inherent technical logic, but is patterned by the conditions of its creation and use (Williams and Edge, 1996). Technology is produced and used in a particular social context, becoming a social construct with its meaning and existence established through a dynamic relationship between the artefact and the specific social practices within the context (Bijker & Law, 1992). Consequently, from a SST perspective, standardisation is understood as socially shaped, i.e. (Sørensen & Williams, 2002; Williams & Edge, 1996)

- The standard is a device for alignment and is understood as socially shaped process as well as an outcome of SST
- The standard is socially constructed resulting from the interplay between different social groups with different interests and different meanings attached to it. Through negotiation, interests align and this flexible interpretation of the standard is narrowed down
- A range of choices are possible at every stage of the standardisation process, and these choices depend on a range of factors within the broader socio-technical setting

The locales in which standardisation (standards development and implementation) take place are populated by different kinds of actors – differing widely in their expertise, context, commitments, and perceived interests: software providers, business consultants, technical experts, market intermediaries, and their suppliers. Often the same actors or actors from the same industry/sector are involved in competing standard setting processes, e.g. suppliers often have to accommodate different customers with different standards requirements.

ICT standardisation is to a large extent influenced by technological innovations, i.e. systems and applications. In practice, the standardisation processes takes place in, and the success and failure of a standard are determined by, complex socio-technical settings that are shaped by a variety of factors and a multitude of actors. As a result, industry structures in many areas of technology are much more complex than it is usually captured in existing studies which depict a simple image of suppliers, users and markets (Russell & Williams, 2002). For example, some technologies are complex to configure and adapt for use in different contexts. Additionally, implementations are approached differently by developers and users. To reconcile their differences, intermediaries are needed who shape a basic technology provided by the suppliers and configure different technological components from a variety of suppliers to meet the users' needs. In this process, universal technical knowledge and local knowledge of the organisational and cultural context of use are combined by all the actors, such as intermediaries, IT developers, managers, and end users within adopting organisations. They not only adopt and allow the diffusion of the technology, but also help users to understand the possibilities and to formulate the requirements, and mediate between users and suppliers (Russell & Williams, 2002; Williams et al., 2000; Windrum, 2000). As a result, the development of technology is a complex and socially shaped process, which results from the interaction between different actors, interests and requirements.

The complexity of standard setting is increased by the multiple level of representation of the actors involved in standards development. There are at least two levels of representation of the actors in standardisation bodies: every actor can be seen to represent their employer on the one hand and their individual professional interests on the other (Schmidt & Werle, 1998). Sometimes, for example informal, official SDOs, a third level of representation is added, the national representation. As a result, a complex web of interests characterises the standardisation arena.

The sociological literature on standards has been less voluminous than the economic literature, but has far more closely addressed the negotiation and implementation of e-business standards. A significant insight from the sociology of science and technology relevant to the study of standards is the critique of technological determinism: it is not necessarily the 'best' standard that will emerge as the dominant technology. The standard which becomes accepted as a dominant design (Abernathy & Utterback, 1978) cannot be seen as a function of technological determinism (Anderson & Tushman, 1990) as often rival designs may be technologically superior (as in the case of QWERTY, see David, 1985). The sociology approach sees the emergence of dominant design as a result of the actions of individuals, organisations and the networks of organisations. The process is thus contingent on the social and organisational context (Anderson & Tushman, 1990). Additionally, the dominance of dominant designs also provides a template for competing solutions: a standard may therefore exert mimetic influence over apparently competing standards developments. For example, the HTML standardisation was used as an exemplar for the development and diffusion of XML standards (Egyedi & Loeffen, 2002).

Technology, and hence standards, can be seen as being 'socially constructed', with the technological choices "explained as the outcomes of the interactions between intentional actors" (Schmidt & Werle, 1998: 16). Co-ordination is difficult in such circumstances since large technical systems rely on the co-ordination of autonomous action by a multitude of individuals and organisations. The analysis of e-business standards is problematic because the standards extend beyond the technologies for exchanging data to encompass the semantics of the information and the underlying business processes (Söderström, 2002). Both artefacts and institutions are channelling, framing and contextualising the actions and interactions of these 'intentional actors' involved in standard creation. Schmidt and Werle (1993), for example, argue the standardisation environment provides standard organisations with institutional rules that determine their "general procedure, the decision process, sometimes the legitimacy of arguments, and the value of consensus" (Schmidt & Werle, 1998: 19). These institutional rules influence the way actors co-ordinate standards development. Along a similar line of argument, Egyedi (2000) argues that standard setting is shaped by the beliefs, values and assumptions embedded in the standard organisational procedure. This 'standardisation ideology' (Egyedi, 2000) regulates the committee process and shapes the rules that govern the standard creation process.

The standardisation field is highly institutionalised (Schmidt & Werle, 1998; Werle, 2001) and many of the standardisation organisations, whether consortia or quasi-juridical bodies such as ISO, share similar institutional features such as negotiation in committee, voluntary participation, consensus rules, and inclusiveness of committees (Werle, 2001). Institutional studies of standardisation have found that SDOs have developed both mimetic and coercive isomorphism (Lawrence, 1999; Werle, 2001), which explains their peaceful coexistence even when they share the same jurisdiction (Werle, 2001).

In this context, the social shaping of emerging standards is explained with the simple interest model from an actor-centred perspective. The various interests of the actors involved are seen as negotiated constructs, forged in the process of alliance building. The actors involved (humans and non-humans) try to translate their interests into the standard; hence the outcome of standardisation is seen as the result of a negotiation process The process of technological change and its outcomes, and in particular the development of standards, is seen as locally constructed, negotiable and contingent (Williams et al., 2004). However, the framework has difficulties in accounting for the influence of prior history, and for taken for granted relations, routines and the broader context and structures. This has not been satisfying in terms of a theoretical account because it only describes the outcome and does not include a broader analytical approach. Jørgensen and Sørensen (1999) have build upon this and introduced their enhanced framework of 'arena of development' (Jørgensen & Sørensen, 1999).

The development and implementation of compatibility standards not only technically defines a method of interoperation between the different components in a network, but most importantly represents a proposal for the future of complex socio-technical systems, i.e., the shape of an inter-organisational network. According to Graham et al (1995), the standardisation process also represents an attempt to align interests, business practices and expectations of an array of people with an interest to develop and use the system that is to be standardised. Therefore, standardisation is not only about providing workable solution, but also refers to articulating and aligning expectations and interests (Williams, 1997).

A major focus of a study on standards dynamics is unavoidably the processes in which actors negotiate the content of standards. A secondary interest is, therefore, the dynamics of these processes as they co-evolve with the standards they are developing. As illustrated in figure 2, the study focuses on the dynamics of IT standards. The area of literature surveyed is limited to texts which provide insights into the dynamics of standards, both during their development and during their implementation.

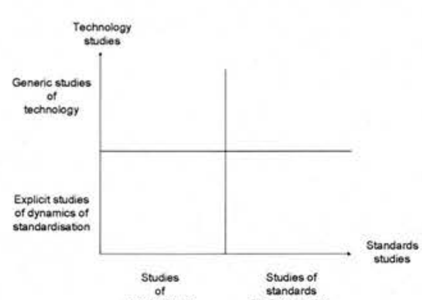

Figure 2. Dimensions of literature review on the dynamics of standards

This narrower literature relevant to a study of the dynamics of standards comes in two clearly defined canons: the generic study of technology, where standards may be viewed as being a particularly interesting sub-set, and the explicit study of the dynamics of standardisation. Orthogonal to this categorisation we may distinguish between literature addressing the formation of standards and literature considering the implementation of standards.

2.4.2 Definition and taxonomy

During the last 20 years, the business world has undergone significant changes. For some organisations, doing business globally has become critical to their survival, and others discover new opportunities by focusing their business in a local setting. In this process of change, ICT plays a significant role both enabling and triggering the re-organisation of business activities. ICT became ubiquitous, invading all aspects of business domain.

The Internet has considerably accelerated the diffusion of inter-organisational networks, and has intensified the collaboration between organisations. Regardless of company size and type of business, today virtually all organisations' ICT systems are interconnected. In such an increasingly networked world, ICT and e-business standards aim to ensure interoperability between both different IT systems within and between organisations. As ICT-enabled collaboration has become a decisive tool in the struggle for competitive advantage, interoperability within and between organisations has become a strategic necessity in all industries. To communicate and collaborate, interoperability is absolutely essential. However, seamless communication and integration of data and information is not possible in the absence of common standards – standards and the standardisation process have gained strategic significance.

In the world of ICT one can find a variety of ideas and definitions of what a standard is. This research follows Tassey, who defines an ICT standard as *"a set of specifications to which all elements of product, processes, formats, or procedures under its jurisdiction must conform"* (Tassey, 2000: 588). 'Standardisation' is used in the literature to address the process of standard setting that is the process leading to a standard. David and Steinmueller (1994) differentiate between four categories of standards: reference standards, minimum quality standards, technical interface design standards, and compatibility standards. Compatibility standards are addressed in relation with network ICTs where they are crucial in that they enable data exchange between components within a particular system or between different inter-organisational information systems (Bunduchi, et al., 2004). Compatibility standards are dealing with issues such as lock-in and path dependencies. Another issue analysed in research is the belief in critical mass (e.g. Granovetter, 1984; Graham et al., 1995).

Common ICT standards are required in order to reduce interfaces' complexity and to take full advantage of the Internet's potential for supporting ubiquitous connectivity, while at the same time reduce costs and increase efficiency, (Schildhauer & Höltkemeier, 2003). Studies of the adoption of Internet technologies have found the lack of standards as the primary reason that explains the reluctance of organisations to adopt Internet based systems (Threlkel & Kavan, 1999). In such an increasingly networked world, ICT standards aim to ensure interoperability between different information systems within and between organisations. Such standards have to address not only the technological dimension of the Internet network such as network protocols, message transport protocols and security standards, but also the content of the data exchanged and the business processes that are facilitated through this network. ICT standards play a crucial role not only in enabling the exchange of information across companies and governments boundaries, but also in facilitating transaction between connected business partners and their IT systems (Berlecon Research, 2003).

A taxonomy of standards

David (1987) proposed a three level taxonomy of the function of standards: reference standards, similarity standards and compatibility standards.

- Reference standards as standards for units and definition
- Similarity standards as standards for minimum acceptable attributes
- Compatibility standards as standards for interfaces allowing interoperation.

However, as the agreement on the meaning of complex data in e-business standardisation is important, this leads to an extension of David's model by two further categories – semantic and process standards – into a more functional-oriented classification. Additionally, other attributes of standards influence the dynamics of the standards development and implementation, specifically the processes assessing compliance with the standard, compatibility with earlier versions and the intellectual property regime embedded within the standards. Therefore, an extended taxonomy for e-business standards includes:

- **Function** – based on reference standards defining a quantity; all e-business standards are built upon reference standards. The second group of functional standards are semantic standards. This refers to the standardisation of the meaning of information and representations of information. The importance of semantic standards has grown with the rise of inter-organisational IT systems, for example the definition of data dictionaries for EDI messages. The third group of standards are compatibility standards, ensuring inter-working between system components. The fourth group of standards are process standards, the standardisation of how things should be done. Increasingly, as e-commerce standards embody models of business processes they become process standards, extending beyond dyadic transactions into a choreographing of the interaction between the systems of two partners. Exemplary of this evolution from pure compatibility towards the convergence of business processes are the RosettaNet Partner Interface Processes (PIPs) developed for supply-chain integration in the electronics sector. As standards become more closely embedded in the context of their use we would expect the role of users to become more significant in standards development. These four categories of standards form a logical hierarchy, with process standards embedded in technology building on compatibility standards, compatibility standards building on semantic standards, and semantic standards building on reference standards.
- **Compliance assessment** – includes functional testing, comparison to a reference standard or audit

- **Compatibility** – backward compatibility to an established or new standard
- **Intellectual Property** - intellectual property embedded within the standard Historically public standards were seen as being public goods and could be contrasted with proprietary technologies where the owners of Intellectual Property Rights (IPR) sought a return on there investment through licensing, with the possibility that the proprietary technology would become recognised as a *de facto* standard. In recent years this distinction has become progressively less clear as the locus of standardisation has moved into consortia and the developers of open standards realise that in areas such as image processing it is difficult to develop standards which do not impinge on existing patents (Blind et al., 2002).

E-business and ICT standards

E-business would not be possible in the absence of communication protocols. Such technical standards play a crucial role in shaping not only the future form of the technology (Williams et al., 1993) but also nature and functioning of the organisation and the relationships between organisations (Tapscott, 2001). Consequently, the standards affect the way in which organisations interact and do business electronically. Today, existing ICT standards enable e-business and facilitating the integration between organisations by interoperability. Generally, as illustrated in Figure 3, ICT standardisation is characterised by addressed at different layers.

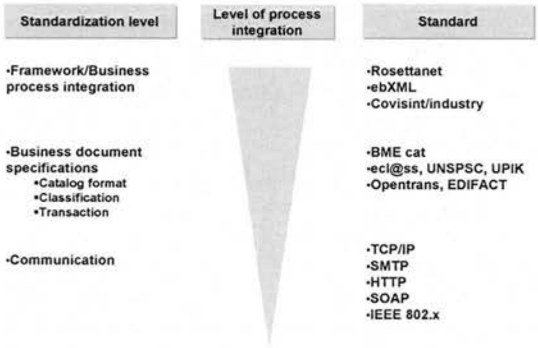

Figure 3. Taxonomy of ICT standards

Most existing research usually includes the two standardisation layers: the framework/business process integration standards, and the business documents specification, in the category of 'e-business' standards (Berlecon Research, 2003; Schildhauer & Höltkemeier, 2003). Examples of e-business standards of the first level are RosettaNet PIP standards and ebXML. Such standards aim to help standardise business processes in order to enable B2B interactions between different organisations.

The organisations that supply such standards are private consortia, either global, cross industry organisations such as OASIS, or industry specific such as RosettaNet for IT and semiconductor industry, and Covisint for the automotive industry. OASIS, for example, attempts to help companies and government users to implement open e-business standards by implementing a service-oriented architecture. OASIS understands e-business/ICT standards as part of IT developments that allow public institutions and companies to develop interoperable systems by establishing common specifications and protocols for e-business. They help their members to implement e-business standards built upon consensus. Such standards benefit both public and private organisations and provide stable targets to which IT vendors can build their products. In contrast, vertical industry consortia aim to establish a standard for use within that particular industry, rather than attempting to develop global, cross industry standards.

Jakobs (2000) collected a number of other classifications proposed in literature, such as for example:

- *public vs industry* distinguished between standards published by SDOs whereas standards emerged from single powerful companies or consortia are referred to as industry standards
- *voluntary vs statutory* which defines the different natures of the underlying processes and the legislative status of its results
- *'de facto' and 'de jure'* standards, which have emerged through the market, and de jure standards, which have been ratified by some legitimate body (Jakobs, 2000: 13-14).

However, the classification of standards as '*de jure*' and '*de facto*' is a classification of the processes that developed the standards rather than a classification of the standards themselves (Jakobs, 2000: 14). The process of standard setting and standard setting organisations (SSB) are subject of discussion in the next sub-section.

2.4.3 Standard setting: process and standardisation bodies

The process of standardisation is an integral part of the world of networked organisations. In literature, different versions of standard life cycles have been identified. Figure 4 depicts an example including six stages of a standard life cycle.

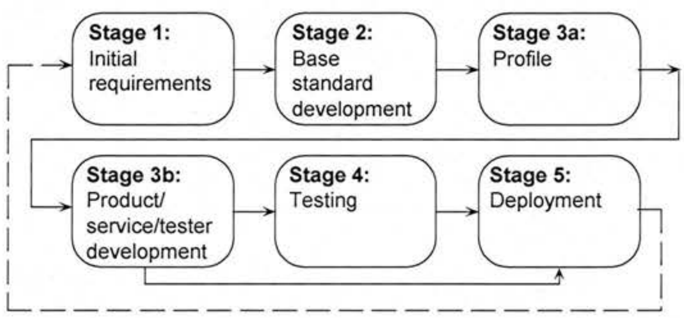

Figure 4. The stages of the standards life cycle (Reilly, 1994)

The stages of the standard life cycle operate in very different socio-technical settings. The locus of standardisation, as well as the actors involved in the process, and their attributes are different in the two stages. For example, in the case of official SDOs or even for private consortia, standards are developed within the standards organisation's technical committees, whereas the implementation is done in the entire market that those standards address. Precisely because of this reason, the existing socio-economic analysis has looked at standard development in isolation from standard implementation. However, to understand the standardisation process "in making", i.e. how it evolves and how it is shaped and structured over time, these different socio-technical settings must be considered together under the umbrella of one concept.

Such an approach allows identifying not only the factors that shape each of the two stages, but also the links that are formed between them as a result of the interaction between these factors. For example, the level of formality of the standard setting may depend on the organisational culture in which standards are to be implemented, as it was the case for clinical standard messaging in the Scottish health service (Bunduchi et al., 2005). In this way, the development process can be informed by implementation issues such as the organisational nature in which implementation takes place, the requirements of the users, the size of the potential market, the willingness of the players to align with it, and the existence of competing proprietary standards. At the same time, the success or failure of a standard implementation may depend not only on factors pertaining to the implementation context, but also on the nature of the setting in which the standard has been developed. For example, the extent to which the standard setting process allows for the involvement of the users may influence the extent to which the emerging standards fit such users' requirements, hence facilitating the implementation process (Bunduchi et al., 2005). Moreover, an approach which brings together the implementation and development stages highlights the role that the various types of intermediaries, such as technology suppliers and user representatives, play in linking these domains of development and use more or less effectively. As a result, the approach allows identifying the complex interaction between the two domains.

Throughout the past thirty years there have been considerable changes in the world of standards setting. Back in the seventies, there was a clear distinction between the then 'monopolist' CCITT[3], a division of the International Telecommunications Union (ITU), on the one hand, and the remainder of the world of ICT standards on the other. CCITT were in charge of standards setting in the telecommunications sector. Basically, they were operated by the national PTTs, which still enjoyed a monopoly situation in their respective countries. ISO was in charge of almost all other ICT-related standardisation activities. The various national SDOs developed their own specific standards, but also contributed to the work of ISO. Over time, two trends contributed to an increasingly complex ICT standardisation environment: the growing importance of ICT and the globalisation of markets.

[3] CCITT: Comitée Consultativ International Télégraphique et Telephonique

In a way, these were coupled, and further accelerated, by the Internet, which was 'discovered' for commercial use in the mid-nineties. Further complexity was caused by the liberalisation of the telecommunications markets and the associated emergence of regional bodies, such as ETSI in Europe, and ATIS in the US and TTC in Asia. This was re-enforced by the still ongoing merger of the formerly distinct sectors of telecommunications and IT, which caused considerable changes in these markets (David, 1995). These processes affected primarily SDOs and the relations between them. In addition, and as 'external' competitors, standards consortia emerged as a new phenomenon. Well-known examples today include, for instance, the W3C (the World Wide Web Consortium), OASIS (the Organization for the Advancement of Structured Information Standards), or OMG (the Object Management Group). At times, such consortia emerged an amazing rate (Cargill, 1995). This rise of consortia was largely in response to the enormous speed of technical development in ICT and e-business systems. 'Traditional' SDOs were widely considered as not being capable of coping with this speed (Besen, 1995; Cargill, 1995).

Until the mid 1980s, standardisation was virtually exclusively dominated by the formal SDOs such as ISO and CEN. However, in the late 1980s the slow and highly bureaucratic processes that then characterised formal SDOs was seen as inadequate to deal with the challenges that resulted from the increasingly shorter life cycles of ICT products. As a result, the number of private standards consortia saw a massive increase during the 1990s, when in less than a decade more than 140 ICT standards consortia were created (Jakobs, 2000).

The emergence of such a huge number of Standard Setting Bodies (SSBs), often with overlapping coverage, caused a fragmentation of the market for standards development. This fragmentation raised the problem of how to co-ordinate the organisations involved in the process. The economic literature has modelled extensively the co-ordination strategies of the players, which represent alternative forms of standards setting (i.e. market versus committee based standardisation).

However, as a result of the supply fragmentation, this also needs to consider the organisations' choice between competing standards setting bodies.

Coordination in standard setting

Standardisation is basically a mechanism for coordination (Werle, 2001; Shapiro, 2001; Jakobs, 2000). Not unlike the research sector, standards setting serve as a platform for cooperation between companies which are otherwise competitors. This function of standardisation is largely independent of the nature of the actual platform; that is, it does not make a big difference whether negotiation and co-operation occur within a formal SDO or an industry consortium.

According to (Werle, 2001), a company has different options concerning standard setting:

- to try and bypass organised standardisation and set a *de facto* standard in the market
- to participate in the work of an official or a private standards organisation
- to set up a new consortium or forum to deal with the standards project

Assuming an organisation decides upon one of the latter alternatives, standards setting work will eventually commence within a working group. Here numerous stakeholders convene and try to come to a solution that meets their needs.

Within such a working group interests of the various stakeholders may differ. According to Besen (1995) four distinct situations are possible. Firstly, common interests where no competing proposals exist and consensus is reached. Secondly, opposed interests where competing proposals exist. Third, overlapping interests where each opponent prefers his own proposal to be adopted, but would rather have a competitor's proposal adopted than have no standard at all. Finally, destructive interest where at least one player prefers not to have any openly available standard at all and accordingly tries to slow down the process. An aspect which needs to be taken into account in addition to the rather more strategic aspects discussed above and which has been largely ignored so far, is the role of the individual in standards setting. After all, at least open standards are made by the members of a working group, not by companies.

Obviously, the above alternatives all come down to the question of competition versus co-operation. The path towards competition may eventually lead to a company's dominating market position with a product or service based on their own proprietary specification. Yet at the same time the virtual absence of other players may render this particular market insignificant. On the other hand, co-operation establishes a broader market for products or services based on open specifications, created through, and capable of accommodating, a number of different players. As Swann (1990) has shown, for instance, a product that succeeds in creating an environment in which other vendors consider it beneficial to produce compatible products will prove considerably more successful than its competitors.

Competition in standard setting

The easiest way to achieve co-ordination would be what van Wegberg (1999) calls the 'Grand Coalition'. This represents the most centralised solution, supported by all stakeholders. The level of co-ordination would assure that a single standard would be established. That is, technologies in use would be fully compatible and positive network externalities could be realised (Van Wegberg, 1999). In practical terms, this would imply that all standardisation work on a given topic would be carried out by one working group.

In practice, however, the process is fragmented in many cases. This may be due to several reasons. For one, different stakeholders may consider different SSBs as optimal for their specific individual needs. Stakeholders (or one individual stakeholder) are dissatisfied with the work of an SSB, and feel that their own consortium would better promote their ideas and technologies. However, the fragmentation of the standards setting world does not necessarily lead to competition. Fragmentation may, for instance, occur based on the geographical scope of an SSB, the industry sector within which it is active, and its 'formal status' (accredited SDO or consortium) (Werle, 2001). Whereas all these distinctions are blurring, the former two do not necessarily lead to competition or conflicts. In 2001, Werle observed that "Conflicts between standards organisations (as opposed to conflicts within one SSB) over their claims of competence or their involvement in overlapping areas of standardisation have been rare" (Werle, 2001). This does not necessarily hold any more today.

Reputation and legitimacy of SSBs

According to Cash et al. (2002), "Legitimacy refers to whether an actor perceives the process in a system as unbiased and meeting standards of political and procedural fairness." Orlikowski & Robey (1991) note that *"...human action is guided by cultural notions of legitimacy ..."*. For SSBs, this implies that they need to establish an adequate level of legitimacy. At least for formal SDOs, this is typically based on government endorsement which, in turn, requires that a *"... voluntary consensus standards body is defined by the following attributes: (i) Openness; (ii) Balance of interest; (iii) Due process; (vi) An appeals process.; (v) Consensus, ..."* (Bukowski, 2003).

Older international SDOs, i.e. ISO did not enjoy any governmental endorsement when they were founded. Even today, any 'authoritative' source of their legitimacy (i.e., why they are referred to as 'formal') seems to be unclear. A widely held belief is that this status was 'earned' basically by tradition – i.e., by having done beneficial standardisation work over decades. People now seem to trust these institutions (which may be to a lesser degree the case in the ICT sector, which is comparably young and where many SDOs were not really fully fit for the job at hand). Typically, consortia do not enjoy the benefit of government endorsement. Thus, they need to explore other routes towards legitimacy. Van Wegberg notes that popular means to establish an SSB's legitimacy include (Van Wegberg, 1999):

- Participation of key players
- A track record in a certain field
- IPR assets
- Co-operation with other SSBs

2.4.4 Shortcomings in existing standardisation research

Typically, the standards literature adequately addresses the development of (initial) standards. Some other studies solely address standardisation implementation whereas very few studies look at the complete life cycle of standardisation, from development to implementation and the further evolution of it. Few studies address what happens to standards subsequently and issues that result from the dynamics of standards implementation have rarely been studied. Some studies have looked on the diffusion of standards but they did not analyse at development (nor included implementation). Others have seen standards as fixed and not changeable.

A study of standards dynamics recognises that standards are not static artefacts which are created fully-formed and diffused as users adopt them. Rather, a dynamic perspective sees standards as being created through a rich social process within which they evolve from loose requirements into defined specifications embedded in documentation though a process of negotiation between interested actors. Once published many standards are not static: they are adapted and interpreted by users. As pointed out by Egyedi (2001), such deviations occur as a result of competitive actions of implementers which aim to lock-in customers, or due to genuine reasons such as the lack of relevance of some of the features of the standard to specific contexts of use. The existence of processes in which standards are reviewed and revised also assumes that standards are dynamic.

Over the years, the literature on standardisation has shown an evolution of the analytical frameworks employed to study the process of standards development. However, as discussed during the introduction to the thesis, most of these frameworks employ a static perspective and address the development process in isolation from the context of standards use. The challenge in analysing the standardisation process is to produce an adequate evolutionary account of the complex dynamics surrounding the standards, an account which includes both the standard development and use settings.

The two areas of standards dynamics that are relatively under-represented in the literature are the dynamics of standards within the organisations developing them, both as they are developed and during use, as users adapt standards to suit a local context. The co-evolution of the standards and the standards development organisations themselves have not been widely described in the literature because there have been few ethnographic studies of the negotiation of standards in standards development and implementation in organisations. To overcome the above mentioned shortcomings, this research is looking at the complete standardisation cycle from standards development to implementation and the further evolution over a full life cycle, including the dynamic aspect of the entire standardisation process and the subsequent outcomes.

2.5 Sociology of Inter-organisational Networks and Systems

2.5.1 Business relationships in networks

Apart from being described from the social perspective, Inter-Organisational Networks and Systems (IONS) are based on technical and business relationships. To complete this theoretical review it is necessary to engage in a brief overview of management and technical-related aspects of business relationships. The inter-organisational network of an organisation consists of different actors (or organisational entities) such as suppliers, customers, competitors, unions, etc. Every organisation interacts within this network with other actors. Interaction can occur, for example, with suppliers in order to purchase goods and services or with customers to sell a product or a service.

Inter-organisational relationships are a complex web in which the organisation is embedded. As business-to-business relationships are becoming closer across a number of industries, a particular type of relational norm is gaining importance (Spekman et al., 1998): the buyer – supplier relationship. According to Wilson (1995) buyer and seller relationships have become an integral part of business-to-business strategies. Further, Håkansson (1989) claims, that a more in-depth understanding of industrial markets can be achieved by studying buyers and sellers simultaneously. It involves simultaneous analysis of the attitudes and actions of both parties and emphasises the essential similarity between the purchasing and marketing tasks in relationships. It sees relationships both as important in themselves and as predictors of individual transaction behaviour which is formed by successive interactions and is reviewed in detail in Håkansson (1989). A relationship can be an interdependent process of continuous interaction and exchange between at least two actors in a business network context (Holmlund & Törnroos, 1997). Furthermore, relationships evolve over time and can be considered to traverse a series of stages characterised by increasing mutual adaptation, reduced "distance" and increasing commitment (Ford, 1982). According to Morgan and Hunt (1994), commitment and trust are key components of a relationship because they encourage the participants:

- to make investments into the relationship
- to resist taking advantage of alternatives which provide short-term benefits and
- not to behave opportunistically with regard to the relationship (Morgan & Hunt, 1994).

The number of involved participants may increase into larger entities such as networks. Håkansson (1989) defines a network as an arena in which a company operates. In the industrial context, a network consists of companies linked together by the fact that they either produce or use complementary or competitive products. Consequently the network always contains an element of both co-operation and conflict.

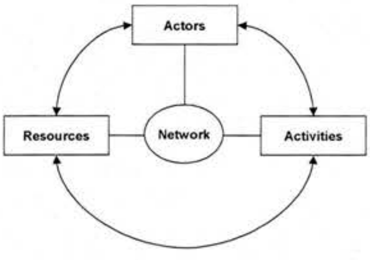

Figure 5. Network model (According to Håkansson (1989: 17)

As illustrated in Figure 5, in theory an industrial network consists of actors, activities and resources: actors are linked together by their performance of complementary or competitive industrial activities which imply that certain resources are processed as a result of other resources being consumed (Utterback & Abernathy, 1975; Håkansson, 1989: 16).

2.5.2 Inter-organisational networks and systems

The economic and political pressure for collaboration in a global and increasingly interconnected world forces global actors to deploy IONS in an effort to create and sustain a flexible network (Tapscott, 2001; Venkatraman, 2000). IONS refer to the computer and telecommunications infrastructure developed, operated and/or used by two or more firms for the purpose of exchanging information that support a business application or process. These firms are suppliers and customers in the same value chain, strategic partners or even competitors in the same or related market (Cunningham & Tynan, 1993; Li & Williams, 1999). Through IONS, business partners arrange routine business transactions. Information is exchanged over communication networks using prearranged formats. In the past, IONS were implemented over proprietary communication links. Today, many IONS have moved to the Internet (Turban et al., 2000) due to the huge benefits promised by research companies and consultancies (own experience). The most prominent types of IONS are for example (Turban & Lee, 2000):

- Electronic Data Interchange (EDI) – providing secured B2B connection over Virtual Private Networks (VPNs) (Emmelhainz, 1993; Sokol, 1995)
- Extranets – providing secured B2B connection over the Internet
- Supply chain management – cooperation between a company and its suppliers
- Portals – electronic platform providing various types of electronic services

The term "electronic commerce" (e-commerce) appeared in the mid 1990s when it was used to refer to the deployment of information technologies to support exchanges with trading partners (Bailey & Bakos, 1997; Klein, 1995; Benjamin & Wigand, 1995). In 1995, for example, Klein identifies four areas that he argues will be affected by electronic commerce: the electronic commerce platform, customer relations, procurement and inter-organisational relations, and internal adjustments.

Such early electronic commerce systems were based on the EDI systems using EDIFACT or X-12 standards. However, as the Internet technologies have pervaded the commercial arena during the mid 1990s, electronic commerce has started to be used exclusively to refer to web based applications (Hoffman & Novak, 1996).

Most of the early uses of the term "e-commerce" in an Internet context referred to companies engaged in buying and selling over the World Wide Web (Hoffman & Novak, 1996). Such a definition reflected some of the earliest uses of Web technologies which moved from only presenting information on the Web to enabling simple transactions between businesses and end customers, which was later named B2C (The Economist, 2000). With the advances in web technology, the application spectrum increased considerably. Businesses were now able to use the Internet to support inter-organisational exchange (B2B), to develop employee portals to support human resources applications, while governments were using the Internet to inform their citizens. Fingar et al. (2000) define e-commerce in two ways: technical and process-oriented. Technologically seen "eCommerce is the use of inter-networked computers to create and transform business relationships" (Fingar et al., 2000: 46). Reflecting the wider applications of Internet technologies, the term e-commerce was re-defined as doing business electronically (Kalakota, 1996), or 'commerce enabled by Internet technologies' (Seddon, 1997) referring to the use of Internet technologies both within and outside the organisational borders (Riggins & Rhee, 1998) rather than the simple matter of buying and selling over the web. E-commerce is often used interchangeably with the term e-business. Davydov (2000), for example, defines e-business as 'an all-encompassing concept of enabling the exchange of information and automation of commercial transactions over the Internet.

Today, e-business is seen as a significant part of the strategy of most companies in their pursuit of cost reduction, efficiency and better performance (Van Hooft & Stegwee, 2001; Venkatraman, 2000). Specifically, it is supposed to "enable business process efficiencies in all aspects of enterprise activities". That is, e-business is one means of implementing business processes and thus, ultimately, business strategies. Yet e-business services are not provided by stand-alone artefacts. Rather, they are embedded in, and part of, a larger system, which also comprises the underlying ICT infrastructure.

Electronic Markets

An electronic market (e-market) is an electronic network of interactions and relationships where information, products, services and payments are exchanged (Turban & Lee, 2000). Buyers and suppliers meet to exchange information about prices and product and service offerings, and to negotiate and carry out business transactions. They are not only at different locations but seldom even know one another. The means of interaction varies between the participating parties and can change from event to event (Turban & Lee, 2000).

E-markets typically involve buyers and sellers who negotiate or execute a transaction in both the B2B and B2C case whereas IONS are used exclusively for B2B applications. An IONS involves information flow among at least two organisations. The major objective is the execution of efficient transaction processing (Senn, 1996; Turban & Lee, 2000) where all relationships are electronically fixed in advance (Turban & Lee, 2000: 8).

2.5.3 Portals as part of e-business

One of the most prominent types of contemporary IONS are portals (Turban et al, 2000). A portal is defined as a linked electronic platform with a single point-of-entry, independent of time and space that enables collaboration through access to multiple sources of information. Sadtler et al. (2004) differentiates between three different types of portal: employee portals, customer portals and business portals. Employee portals are platforms designed to facilitate internal activities of a company, whereas customer portals present information in a structured way to end customers. Business portals focus on business partners, for example, they provide suppliers with information and, or access to, the buyer's internal systems. The functionalities incorporated in a business portal facilitate the buyer – supplier relationship and ensure tighter collaboration (Sadtler et al., 2003). In this section, the focus is on business portals that integrate content, applications and processes between different business partners in order to:

- Improve communication and collaboration
- Provide real-time access to information held in disparate systems
- Personalise user interaction and provide a unified interface
- Integrate relevant data, applications and business processes

Portals have been widely deployed within and between different companies. The one's which operate between business partners are to a large extent based on existing supplier contracts. Accordingly, the use of a supplier portal by a supplier is another form of collaboration between the buyer and the supplier. However, the success of a portal depends on the functionality and the user acceptance. Additionally, portals are susceptible to issues of technical security. Functionality, acceptance and security are the three key topics which can encounter active or passive resistance for reasons of trust. The process of building trust is heavily based upon past experiences that serve to prove and then reassure trustworthiness (Selin, 2006). However, apart from trust there are other issues surrounding standardisation of IONS.

2.5.4 Standardisation issues of IONS

The development, implementation and use of IONS and related standards are a socio-technical process of negotiation. Its open-ended character, similar to large information infrastructures, raises theoretical questions and may lead to practical problems in terms of adoption. Primarily, the reason for this is that decisions about the technology and the standards have to be shared among a group of actors of different organisations. As those organisations differ in their IT applications, systems and business practices, IONS pose multilayered problems of harmonisation and standardisation (Graham et al., 1995). Particularly supply chain standards may call for a convergence of business practices (e.g. change in organisational setting of the individual organisations, etc.) in a user community and have to be agreed upon.

The issues of IONS with regard to standardisation are manifold and not particular new, as contradicting factors shaping IONS were already identified during the development and implementation of Electronic Data Interchange (EDI) in the past decades (Graham et al., 1995). IONS and the Internet have emerged as perhaps the key technological developments of the twentieth century (McLoughlin, 1999). From a simple technical point of view, IONS are ICT-based systems bridging across organisational borders (Bakos, 1991; Konsynski, 1993). These systems have redefined the roles of and relationships between business partners, allowing new ways of value creation and inter-organisational arrangements and process designs (Riemer et al., 2001). However, the company-bridging aspects of IONS imply the shift of boundaries of the organisations participating in a network. IONS consist of different levels of relationship structures oscillating between the extremes of competition and collaboration, far beyond traditional business relationships usually existing between independent organisations in the market (Kumar & van Dissel, 1996).

In an increasingly globalised world, corporations are focusing on closer collaboration within supply chains and subsequently, global processes tend to get increasingly complex (Hanseth & Braa, 2000). According to Hanseth and Braa (2000), *"as corporations become more global, they become more integrated with each other and with distant local contexts"*.

According to Ciborra and Hanseth (2000), the arena of the development of large information infrastructures is shaped by an increasing globalisation and strategic alignment of actors. Whereas globalisation opens an organisation's doors to others, the process of strategic alignment is increasingly long and difficult, fragile at the same time and has to include a variety of actors and resources which try to influence each other to constitute the socio-technical order. Consequently, forces, feedbacks and self-reinforcing actions are at all play in shaping an outcome that is hard to be predicted (Ciborra & Hanseth, 2000: 5).

In studying the dynamics of corporate information infrastructures, Ciborra and Hanseth (2000) unveil unintended "management games" that govern the adoption of infrastructures in large bureaucratic corporations as well as "the assessment of the role technology played in reinforcing existing power structures" (Ciborra & Hanseth, 2000: 1). The aim of the research particularly focused on the gap between initial goals and plans and current outcomes (ibid). Moreover, another aspect of attention was the various "initiatives taken by management, specialists and users to cope with deviations and variance in outcome" (ibid).

However, IONS require interoperability of the different systems in a network. This is not possible in the absence of common standards. Standards are necessary because the formerly individual organisations had built up independent IT solutions. However, the tension between standardisation and flexibility in IT implementation has been highlighted by Hanseth et al. (1996). Standards rarely exist in hermetic isolation and may be combined by users to create innovative constellations. Technological choices were influenced by local vendors and prevailing national communication standards, resulting in a lack of integration in both hardware and software (Hanseth & Braa, 2000). However, as already analysed in the case of EDI, networking organisations tend to build local/national communities with locally influenced standards first because they start collaborating on a vertical supply chain level within their sector or within their national environment (Webster, J., 1995).

Although often portrayed as narrow technical matter, the development and implementation of standardised IONS – such as portals – is a rich social process, and is subject to wider and more complex influences than only those of a strict technological nature (Williams, 1997). According to David and Steinmueller (1994) and Jakobs (2000), IT standard development tends to be dominated and controlled by major producers, with limited user involvement. For example, IT standard consortia such as OASIS are dominated by large IT vendors' representatives who have the financial resources as well as the technical expertise to participate (Jakobs, 2000). However, in the case of IONS standards such as data exchange standards, large users are often in the position to impose their own standard into the market, by-passing standard setting bodies (Bunduchi et al., 2005). As suggested by current EDI research, the explanation is often related to the power relationships between the relevant actors (Ratnasingam, 2000; Webster, J., 1995).

Not only social shaping of technology literature, for example Webster, J. (1995), but even mainstream economic literature, for example Kumar and van Dissel (1996), identified economic, technical and socio-political arguments as areas of potential conflicts in alliances of IONS.
Within organisations, interactions between various groups can be observed in adopting a new technology (e.g. between strategic and functional departments). Additionally, a constant tension may be observed between the need to enforce standard practice and flexibility and the need to involve user groups in getting the technology to work through local adaptation (Russell & Williams, 2002: 71).

In a study of Electronic Data Interchange (EDI) systems, Graham et al. (1996) noted that EDI had evolved from being seen as a technology which could provide developers with competitive advantage into a technology where the benefits to a trading community from sharing an agreed standard outweighed the advantages from differentiation. This realisation led UK retailers to co-operate through the Article Numbering Association to develop e-business standards. The costs of two competing standards led standards organisations to clearly define their areas of competence, as seen in an agreement between ANSI and EDIFACT and sectored or local initiatives avoiding encroaching on the domains of other bodies (Graham et al, 1995). This same process of SDOs actively eschewing conflicts is seen today in the memorandum of understanding between ISO, IEC, ITU, UN/ECE and OASIS in e-business standardisation. If there are standards wars in e-business and e-government standards, they are very cold wars.

The costs to a user sub-community of being locked into an inefficient standard are mitigated by the flexibility of e-business standards allowing local dialects to emerge (Damsgaard & Truex, 2000). The focusing of technology development on problems widely accepted as barriers to use, termed by Hughes "reverse salients" (Hughes, 1983), is a useful insight into the dynamics of standards. In the early stages of the development of a technology standards may be subsidiary to performance and even feasibility, but once the technology has been demonstrated efforts may be redirected towards standardisation.

This chapter has reviewed a large number of existing literatures of sociology of technology, organisational studies, economics and sociology of standardisation and the sociology of IONS in order to ensure the interdisciplinary approach as well as to get a better understanding of the single theories and their analytical frameworks used. In the subsequent methodology chapter, this knowledge will be used to develop a new model.

Chapter 3. METHODOLOGY and RESEARCH DESIGN

3.1 Introduction

This chapter outlines the methodology used and the research design applied. Empirical research is guided by the underlining philosophy of the research design. The research philosophy helps to configure the overall research and to identify different avenues or limitations of particular approaches (Easterby-Smith et al., 1991). One of the key choices in methodology at research design relates to the dichotomy frequently drawn between the two main research paradigms: positivism and phenomenology (Easterby-Smith et al., 1991; Miles & Huberman, 1994; Creswell, 1994; Yin, 1994; Punch, 1999).

The basic beliefs of the positivist paradigm are that the world is external and objective, the observer is independent and science is value-free. A researcher should therefore focus on facts, look for causality in formulating hypothesis and test them. Preferred research methods are operationalising concepts to allow measurement of sample that, ideally, are large. In contrast to the positivist view, the basic beliefs of the phenomenological perspective are hang on the fact that the world is socially constructed and subjective, that the observer is part what he observes and that science is driven by human interests. Thus, the researcher is interested to explore the focus on meanings and tries to understand what is happening. He looks at the completeness of each situation and develops ideas through induction from the data gathered. Consequently, multiple methods are employed to establish different views of phenomena, and small samples are investigated in depth or over time (Easterby-Smith et al. 1991: 27).

The main strengths of the positivist paradigm are the wide coverage of the range of situations as well as the economic statistics that can be derived from large samples. However, this concept seems to be inflexible and artificial in terms of the understanding of processes or the significance that people attach to actions (ibid).

Strengths and weaknesses of the phenomenology paradigm tend to be complementary. Whereas the disregard of processes is a weakness in the positivist perspective, this is a strength in terms of being able to look at change processes over time, understand people's meanings and adjust to new issues and theories that emerge in the phenomenological approach. However, the positivist approach requires significant time and resources for data gathering and the analysis and interpretation of data (Easterby-Smith et al. 1991: 32).

The choice of a research paradigm is important because it influences the empirical research in terms of research strategy. Techniques for data collection and methods for data analysis are based on the philosophical assumptions of the research paradigm chosen at the conception of the study (Easterby-Smith et al., 1991; Hussey & Hussey, 1997). For this reason, the research paradigm needs to be based upon criteria that match the research strategy with the research questions of the study (Hussey & Hussey, 1997). Such criteria include: (1) the nature of the problem studied (Creswell, 1994), (2) the context of the research and the researchers personal preferences (Easterby-Smith et al., 1991) and (3) the research problem (Hussey & Hussey, 1997).

This research is approached from a phenomenological perspective. The adoption of the research methodology is guided by the author's preference and the research objective to link the in-depth practical experience of a six-year project with the relevant theories.

After an introduction into the research methodology, the research questions are described in detail. Subsequently, the research design with a focus on case studies is illustrated as well as the frameworks used to draft a new model. Finally, the detailed tools for data collection and data analysis are introduced, followed by the benefit of this research.

3.2 Research questions

The thesis seeks to analyse, from an SST perspective, the factors leading to the approach of developing and implementing standardised technology as well as the effects of them on cross-company processes and buyer-supplier relationships in automotive networks. According to Berg (1995), the purpose of research is to discover answers to questions through the application of systematic procedures (Blaikie, 2003: 59). In the literature about research methodology, the importance of research questions is illustrated differently, as can be observed across Yin (1993), Miles and Huberman (1994), Creswell (1994), Marshall and Rossmann (1995) or Fleck (1998). Whereas Yin has linked research questions to types of research designs such as experiment, survey or case study (see next section), Fleck insists upon the importance of the formulation of research questions in terms of *"the central step that essentially determines success in qualitative research"* (Fleck, 1998: 47). According to Blaikie (2003), the research objectives determine the research questions and both are strongly linked with the research topic and the research strategy (Blaikie, 2003: 61).

Based on the existing theory and in-depth practical project knowledge and industry background, a conceptual model was developed to answer the following research questions. The research topic is reflected in the research questions. Therefore, the results of the research questions contribute to both theory and practice. Due to high pressure in the automotive industry to collaborate closer and integrate business partners, an inter-organisational portal strategy is needed. Thus, the first research question is:

(1) What are the factors that shape the emergence of an inter-organisational portal strategy?

The emergence of an inter-organisational portal strategy will be analysed from the perspective of a car manufacturer (Original Equipment Manufacturer, OEM). However, this also involves other actors such as suppliers and intermediaries or consultants. External market pressure and internal requirements to reduce cost and risk as well as to optimise processes are the main triggers for an OEM to develop an inter-organisational portal strategy. Another trigger is to take advantage of Internet technology to reduce costs. Therefore, the inter-organisational portal strategy has to take into consideration not only the already existing business relationships with suppliers but also any existing IT strategy and the IT infrastructure that has to be integrated with internet-based solutions. Moreover, political issues might occur within the OEM and with suppliers in terms of different strategic alternatives.

The second research question to be answered is about the dynamics of standards:

(2) What causes the dynamics in developing and implementing a standardised supplier portal?

The existing empirical literature in standardisation has adopted a static approach towards the study of the standardisation process and the interaction between the various stages of a standard's life cycle. Its influence on the evolution of standards over time has been largely ignored. Thus, the approach attempts to study the standardisation process in a dynamic way that covers the different phases such as strategy, development, implementation and use phase, as well as taking into consideration the standardisation setting context and the actors. The analysis will also look, from a stability perspective, into the previous history of a standard and how earlier versions may affect future development. This involves the reasons that cause dynamism, for example in terms of the realignment of a standard.

Finally, the third and fourth research questions focus on the outcome of standardisation and on role the dynamics aspect is playing:

(3) How do these dynamics pattern the outcomes? And how does local change take part in the wider context of the sector?

The implementation of a certain standard has important consequences for the participating organisations on different levels. For example, the extension of corporate boundaries in order to be part of a larger network may create qualitative and quantitative effects with regard to organisational, technical and social aspects. In this way, adoption of a particular standardisation strategy can generate complex interactions between the technology and the participating organisations that might influence their monopoly, flexibility and/or efficiency. The study of the interrelation between IONS standardisation and the modelling of good business practices will eventually outline practical implications and yield recommendations how to minimise or avoid the observed negative effects and how to best exploit the positive ones.

3.3 Research design

3.3.1 Research strategy

In social sciences, five major research strategies exist that can be used for exploratory, descriptive and explanatory purposes: experiments, surveys, archival analysis, histories and case studies (Yin, 1994). The choice of research strategy depends on three factors: (a) the type of research question posed, (b) the extent of control an investigator has over actual behavioural events and (c) the degree of focus on contemporary as opposed to historical events (Yin, 1994: 4).

For research questions such as "how" and "what" regarding a contemporary set of events over which the investigator has little or no control, the case study is considered to be the best research strategy (Yin, 1994). The case study approach is preferred in explanatory research examining emerging phenomena and contemporary events, and relies on two sources of evidence: direct observation and systematic interviewing (Yin, 1994: 8). According to Yin (1994), a case study is "an empirical inquiry that investigates a contemporary phenomenon with its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident" (Yin, 1994: 13) (see also e.g. Creswell, 1994: 12; Benbasat et al., 1987). A case study strategy is not a single specific method of data collection such as ethnography or observation. Case studies could also include other sources of data such as literature studies (Yin, 1994). Additionally, every case investigation should have a general analytic strategy, to guide the decision regarding what will be analysed and for what reason (Yin, 1994). Thus, the role of the strategy is to support the investigator to choose among different techniques and to complete the analytic phase of the research successfully. According to Dube and Pare (2003), the setting where the case study was conducted, the specific period of time under investigation, the data collection periods and whether or not the researcher was able to gain sufficient access and has spent enough time to develop an intimate understanding of the setting and the phenomenon of interest, are very important with regard to credibility and generalisability (Dube & Pare, 2003).

The single-case study as a research design was chosen for the pragmatic reason that the standardised portal development and implementation in the automotive industry context had been a real time event and a very large-scale innovation project that the author had access to. Prior to the consultant work for the Global Procurement & Supply department of DaimlerChrysler, I have a long history of work experience. With an engineering background, I hold a degree in business administration with a focus on computer sciences. After starting my career at the central purchasing department of Siemens, Germany, I joined the KPMG procurement practice in Paris, France, where I worked in the area of procurement and supply, followed by an engagement as Content Director for Commerce One.

SST provides guidelines and concepts to explore both continuity and change (Sørensen & Williams, 2002: 89), and this approach seems to represent best the environment of current situations where ICT innovations such as portals are deployed in the industry. In SST, the case study approach attempts to explain the specificity of processes in different areas of technology and different domains of application, and the dependence of outcomes on contingent factors such as history and social settings. This single case study is not only a description of the highly complex setting of its environment, but also of the conditions under which a particular outcome was produced and how they can be analysed.

In this thesis, the researcher explores a single phenomenon ("the portal case") bounded by time and activity ("project") and collects detailed information by using a variety of data collection such as ethnography, quantitative and qualitative data procedures including participant observation during a sustained period of time (six years). In case study research, the four basic types of designs are shown in Figure 6.

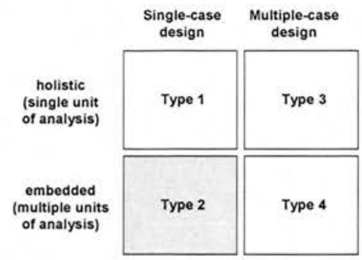

Figure 6. Basic types of designs for case studies (Yin, 1994: 39)

Type 1 – single-case holistic design
Type 2 – single-case embedded design
Type 3 – multiple-case holistic design
Type 4 – multiple -case embedded design

An appropriately developed theory is the level at which the generalisation of case study results will occur (analytical generalisation). Four tests have been commonly used to establish the quality of empirical social research (Yin, 1994: 32): (1) construct validity – establishment of correct operational measures, (2) Internal validity – establishment for causal relationships (for explanatory/causal case studies only), (3) External validity – establishment of domain to which the study's findings can be generalised and (4) Reliability – demonstration that operations of study such as data collection procedures can be repeated, with the same results (ibid: 33). As a detailed description of the research context is necessary to assess the credibility of the research results and findings, and to determine their validity and generalisability (Punch, 1999: 30; Miles & Huberman, 1994: 36), the context of this case study will be described in chapter 4 (Benbasat et al., 1987; Yin, 1994).

In each explanatory case study, the unit of analysis has to be specified, whether it is, for example, a specific technology, a methodology, or a particular type of organisation. The definition of the unit of analysis is related to the way the initial research questions have been defined (Yin, 1994: 22). This is critical in understanding how the case study relates to a broader body of knowledge (Dube & Pare, 2003). As Markus (1989) notes, it is critical to the practical significance of the findings that the theory rests on the appropriate unit of analysis (Markus, 1989). In an explanatory case, a clear definition confirms that the unit of analysis under study is consistent with the boundaries of the theory being tested (Dube & Pare, 2003: 610). As illustrated in Figure 7, this case study uses five different units of analysis: the actors, alternative strategic options, networks, context and resources.

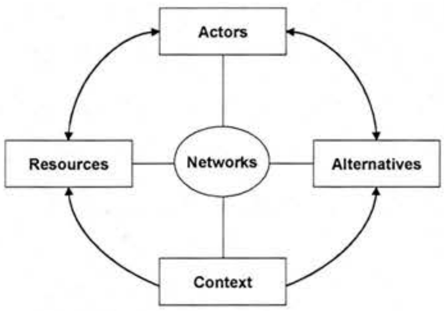

Figure 7. Units of analysis

Critical reflections

This research follows a single-case embedded case study design. Following Yin, (1994) single case study design was chosen because it enables the researcher to observe and analyse a phenomenon previously inaccessible to scientific investigation (Yin, 1994: 38-40). This choice is motivated by the long-term engagement in an IONS portal implementation project and the strong professional industry background of the researcher. The potential vulnerability of the single-case design is that this case may later turn out not to be the case it was thought to be at the outset (Yin, 1994: 41; Punch, 1999: 153). Thus, single-cases require careful investigation of the potential case up-front, to minimise the risk of misrepresentation and to maximise the access needed to collect the case study evidence. In this study, ethnography is used to support the single-case approach and to establish a longitudinal perspective in order to ensure reliability and generalisability. According to Lipset et al. (1956), the goal of a single case study is to do a "generalising", not a "particularising", analysis (Lipset et al., 1956: 419-420).

Some researchers argue that the case study approach suffers from the small possibility of valid generalisation: case studies provide little basis for scientific generalisation. However, the results of a single case study do not represent a "sample" and the researcher's goal is to expand and generalise theories (analytic generalisation) rather than to enumerate frequencies (statistical generalisation) (Yin, 1994: 10).

The subsequent descriptions of the strategy, development and implementation of the global supplier portal are mostly based on my personal participant observer status in the project. The descriptions are based on a chronological basis and the information derives from personal observations in project meetings and workshops where I was directly or indirectly involved. Additionally, internal documentation came from multiple sources which led to a difficulty in citation. The direct involvement in the project as participant observer linked with personal professional experience shaped a particular viewpoint. To solve this issue and to include another perspective into my descriptions, managers from DC IT, GP&S and Covisint were interviewed one year after the pilot start of the portal.

3.3.2 The frameworks used

As it is an issue to analyse the context of a case, the single-case study approach was complemented by concepts of the SST research and the organisational studies strand, namely the concept of 'arena' of Jørgensen (1999) and the 'firm-in-sector' approach of Whipp and Clark (1986).

Arena of development

The locus of technology innovation has received a lot of attention in recent social studies of technology (detailed description in chapter 2). However, the complexity and dynamism of standardisation set specific challenges for theory building. According to Fomin et al. (2003), theoretical frameworks have to fulfil a number of criteria in terms of openness and the ability to capture the essential features of the standardisation process and its outcomes. Also, concepts should take into consideration the standardisation agreements related to technical artefacts, the involvement of multiple activities (including decision making and technical construction) and also the change of the standardisation process over time and space across a set of diverse actors who do not necessarily share the same interests (Fomin et al., 2003). I will return back to these aspects when developing the new framework (in chapter 7).

A "development arena" is defined as a space which holds together the settings and relationships that comprise the context where a standard develops, and includes three distinct elements: (1) a number of elements such as actors, artefacts and standards, (2) a variety of locations for action, knowledge and vision, and (3) a set of translations that shape and play out the stabilisation and destabilisation of relation and artefacts (Jørgensen, 1999). The notion of "development arena" emphasises the idea that a particular product or process is shaping and changing throughout its lifetime, and that the processes of market creation, user positioning, recruitment and interaction are as important as the early stage of development in shaping the product (Jørgensen, 1999).

The "development arena" concept is very similar to the Actor Network notion of "actor worlds" (Callon, 1986) discussed in chapter two. Callon's "actor world" describes how actor networks are built and maintained, and how they break down, but it has problems dealing with broader structures, such as the issue of competition between actor worlds (i.e. how different such actor networks compete in building different actor worlds). Within the ANT framework, these networks are just other, more durable actor networks. To address these shortcomings, Jørgensen and Sørensen (2002) have introduced the concept of a "development arena" which frames the heterogeneous processes in technological change drawing from existing theories of technology management. The concept consists of the notion of configurations defining a space containing certain orderings. The concept complements innovation economy and ANT; elements from both theories have a place in the arena as 'configurations' (ibid: 218). It provides a space for conceiving and visualising the fight between competing attempts at translating and stabilising heterogeneous elements into concrete technologies and networks (ibid: 218).

The arena concept of Jørgensen (1999) is one concept which allows for inclusion of a broader context and addresses the issue of competition and co-operation between different actor networks, to explain how different actor networks co-exist and interfere with each other within a certain space. In this way, the notion of "development arena" can be applied to explain the evolution of standards as a result of competition and co-operation between different networks of actors (Jørgensen, 1999).

The development arena concept also enables a multi-level analysis that encompasses the interactions between various actors networks involved in standards development. It aims to capture key participants and features of particular contexts of innovation. This concept of a special innovation development space is characterised by a population of actors and artefacts, and by the relationships between them. The actors, artefacts and processes are characterised and delimited by a cognitive space that holds together the settings and the relations within that represents the context for technology developments. Conceptually, it allows for the inclusion of competition between the actors, the entry of new actors and strategic realignments that may arise in an increasingly 'globalised' innovation landscape. Thus, the "arena of development" concept accommodates the analysis of the development and interaction of multiple networks better than the widely-adopted actor network theory notion of "actor worlds" (Russell & Williams, 2002; Jørgensen & Sørensen, 2002).

The notion of development arenas is thus a helpful instrument to analyse the dynamics of standard setting and the changes in inter-organisational relationships with regard to the development and implementation of a standard. In this context, interestingly, both concepts presented by Jørgensen and Sørensen (1999) as well as by Clausen and Koch (1999) pay attention to the management of a company, how decisions are being made regarding the development and implementation of a technology, and how a company positions itself in the market by following certain management strategies.

The firm-in-sector framework

As discussed in Chapter 2, ANT does not deal with different levels. In the framework developed different levels are introduced, the meso level – the industry context, and the firm level - the micro level, which are both important to be analysed separately and in their interplay. The firm-in-sector framework is included in the new framework to draw attention to the comparative dimension of the industry context as well as the historical and cultural dimension which allows for an intra-organisational analysis.

Based on the work of Pettigrew (1985, 1987), Whipp and Clark (1986) investigated the process of design and innovation in the automotive industry. In their study, they analysed for the first time the process of innovation in the automotive industry from a product, process and work organisation perspective. The authors examined the experience of the Rover Company and their major innovation project during the 1970s and 1980s in the context of a changing global car industry (Whipp & Clark, 1986).

Whipp and Clark criticised the research approach of many economic theorists approaching innovations, and particularly strategic innovations, only from a product and process perspective, neglecting the fact of the dependant change in work organisations. Above all, they noted the small progress which had been made so far in unravelling the roles and relationships within the process of innovation and in management and labour (ibid: 7). Other points of criticism included the insufficient historical and comparative component in analysing innovations as well as the fragmented specialist approach of analysing innovations instead of focussing on the total process (ibid: 8). Abernathy (1978) analysed long-term changes in products and production processes from an economic and engineering point of view. Whipp and Clark (1986) extended Abernathy's work by adding the knowledge of social scientists of work organisations encompassing the entire process of design and innovation (Whipp & Clark, 1986).

For the first time, the innovation study of Whipp and Clark (1986) analysed the process of innovation in the automotive industry from a product, process and work organisation perspective. Their framework of inquiry analyses product, process and work organisation and consists of four major pillars (see Figure 8): the historical dimension, the comparative dimension, the sector and the enterprise dimension (Whipp & Clark, 1986: 16).

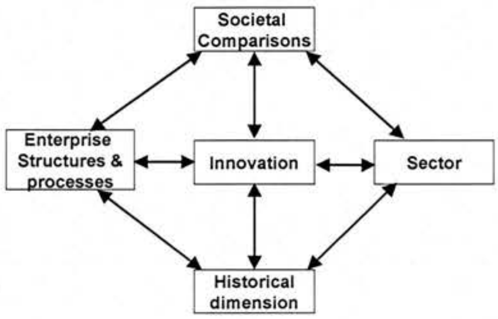

Figure 8. Framework of inquiry (Whipp & Clark, 1986: 15)

The framework allowed for focusing on "the interrelationships between the design of products, production processes and work organisations by addressing the multiple structures within the enterprise and by locating design and innovation within the appropriate historical perspective and comparative contexts" (Whipp & Clark: 14). Consequently, innovation in productive units is analysed along the historical and comparative dimension and on the two main levels of the enterprise and the sector (ibid). In analysing the whole process of design and innovation in a longitudinal study of Rover, Whipp and Clark (1986) in their 'analytically structured narrative' (ibid: 211) found that corporate knowledge is highly specific and politically embedded. However, even nearby productive units have had difficulties translating corporate policies into specific projects (ibid: 211). The study revealed a various number of competing and interdependent staff who were directly and indirectly involved (ibid). Therefore, the design process as a strategic innovation was shaped by 'large degrees of uncertainty and indeterminacy' due to multiple opportunities to shift directions (ibid: 213). The innovation process becomes a chance for many interest groups who used it to advance their agendas, reshape power relations or selectively interpret major corporate policies. Consequently, those struggles and conflicts led to a fragmentation of the entire process (ibid: 213).

To integrate the dynamics of innovations and industrial change, Whipp and Clark (1986) developed their framework of inquiry by focusing on the interrelations involved in innovations, processes and work organisation by addressing the multiple structures within the enterprise and by locating innovation within the appropriate historical perspective and comparative context (Whipp & Clark, 1986). In analysing the whole process of design and innovation in a longitudinal study of Rover, Whipp and Clark (1986) in their 'analytically structured narrative' (ibid: 211) found that corporate knowledge is highly specific and politically embedded. However, even nearby productive units have had difficulties to translate corporate policies into specific projects (ibid: 211). Therefore, the design process as a strategic innovation was shaped by 'large degrees of uncertainty and indeterminacy' due to multiple opportunities to shift directions (ibid: 213). The innovation process becomes a chance for many interest groups who use it to advance their agendas, reshape power relations or selectively interpret major corporate policies. Consequently, those struggles and conflicts led to a fragmentation of the entire process (ibid: 213).

Regarding the sector dimension, this study will analyse the relationships between business partners in the automotive industry, particularly in the context of IONS implementation. Interviews of consultants, service providers, OEMs and suppliers are complemented by the analysis of available documentation of technology implementation in the industry. Within the enterprise dimension, interviews with actors from different business departments and top management have been carried out. Additionally, all documentation available such as, for example, production/procurement processes, supplier policies, company ethics, etc. have also been analysed.

Enterprises possess a repertoire of structures which are part of the corporate culture. This fact generally presents a problem in developing a processual perspective to handle the notion of a structural repertoire *"in such a way that events occurring* *infrequently lead to the transformation of the repertoire into a new structuration"* ('structure/event/structure') (ibid: 41). The inclusion of the historical dimension covers the changes in the automotive industry that could be observed in the past decades. The quantitative and qualitative data collection and analysis, and the ethnographical approach, try to avoid misinterpretations often experienced in snapshot case studies which only allow an episodic view on phenomenon. Finally, the comparative dimension reveals the role of associations (industry institutions) in the automotive industry in the context of the deployment of standardised IONS in the entire industry, supplemented by interviews with key actors of other OEMs and available documentation.

Although the 'firm-in-sector' framework is a useful concept it provides a very schematic treatment of the sector. In this study, a more specific view on different levels is needed due to the fact that supply chains are both of a process and technical nature.

3.3.3 Approach to draft a new framework

As illustrated in Figure 9 a new model consisting of both of the concepts of 'arena of development' and 'firm-in-sector' has been developed.

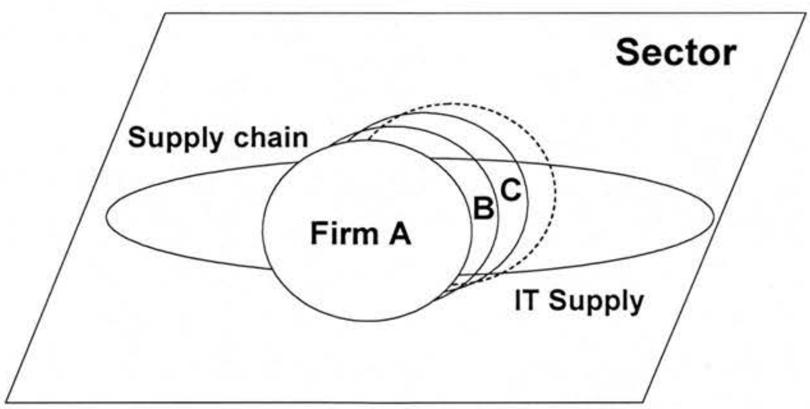

Figure 9. The standardisation arena and the 'firm-in-sector' concept merged

The actors are understood as the "relevant social groups" (Bijker & Law, 1992) who hold a stake in the development and implementation of the new standard. For example, the standardisation arena comprises the companies that want to develop and implement a new standard: software providers, business consultants, technical experts, market intermediaries, and their suppliers. Quite frequently, the same actors or actors from the same sector are involved in competing standard setting processes, e.g. suppliers often have to accommodate different customers with different standard requirements. As a result, a complex web of interests characterises the standardisation arena which is leading into complex interaction amongst them.

The actors in the standardisation arena are linked in a complex organisational setting which is characterised by two levels of analysis: the company layer on a micro level and the industry layer on a meso level. On the micro level of analysis, i.e., the company layer, the actors are linked through a concrete IONS standardisation project and can be characterised not only by their relationships but also by their organisational structure and culture. Consequently, the level of analysis is much more detailed than on the industry level. Here, the focus is on a specific company driven by Internet-based technological innovations and market triggers, and directly involved in IONS standardisation initiatives. This particular company is embedded in its industry, incorporating structures and processes, organisational culture, market posture or arenas of power (Whipp & Clark, 1986). As this company has set up a dedicated project team which has been in charge of a specific IONS standardisation project to improve inter-organisational collaboration between players in the industry, the nature of the relationships between the single players can be analysed in detail, for example in terms of trust and power.

The next focus of attention is intermediaries such as electronic marketplaces (e-market) and/or consultants. The role of the e-market is ambiguous insofar as the intermediary is a technology provider connected to the industry and the company through a set of new technologies. The intermediary is the formation and demise of a coalition of companies that coordinate IONS development, standardisation and implementation (Chwelos et al, 2001; Ratnasingam, 2000; Venkatraman, 1994). This standard setting coalition attempts to dominate the market by introducing a de-facto standard, a standardised technology platform, which is called 'industry standard' or 'best practice'. In doing so, they develop standards around a template of work practices from the context of their early development and use (Sørensen & Williams, 2002). This standard-setting coalition in an inter-organisational network has the potential to constrain innovation by promoting a particular solution as best practice and de-emphasising others (Swan, 1994: 86).

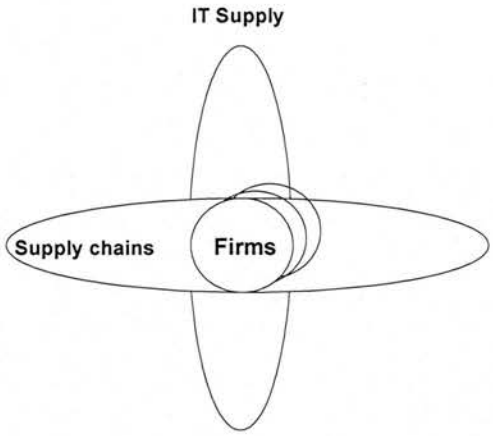

Figure 10. Companies collaborate in supply chains

In contrast to the company layer, on the meso level of analysis, i.e. the industry layer, the focus is on the entire industry including the market with manufactured and sold products and players such as manufacturing companies, suppliers, industry intermediaries, consultants or industrial associations (see Figure 10). The actors are linked through their supply chains which are electronically mediated by ICT and can be characterised in terms of their role in the industry, the nature of their relationships and the pressures they are forced by.

3.4 Data collection and data analysis

3.4.1 Data collection

The research methodology follows the principles of qualitative research inquiry (Creswell, 1994), and a mixture of quantitative and qualitative techniques are used for data collection and analysis. Benbasat et al. (1987: 381) point out that *"a clear description of the data sources and the way they contribute to the findings of the research is an important aspect of the reliability and validity of the findings in case research"*. The connection of the data collecting method provides the link between research purposes, research questions, research strategy and data collection techniques (Marshall & Rossman, 1989: 78).

The data collection is based on multiple data sources such as ethnographical observation, quantitative data gained from an online survey, and qualitative data gathered through semi-structured interviews and internal project documentation as well as publicly available information (Blomberg et al., 1995; Button & Sharrock, 1996). In this case study, each of the research questions were answered by using ethnography, documentation and semi-structured interviews.

Ethnography

Hammersley and Atkinson (1995:1-10) claim that ethnographical research is done by a researcher who participates, overtly or covertly, in people's daily lives for an extended period of time, watching what happens, listening to what is said, asking questions and collecting any other relevant data (Punch, 1999: 157). Wolcott (1988) points out *"ethnography means, literally, a picture of the way of life of some identifiable group of people. Conceivably those people could be any culture-bearing group, in any time and place"* (Wolcott, 1988: 188). According to Easterby-Smith et al. (1991), ethnography requires the researcher to *"immerse himself or herself in a setting and to become part of the group under study"* (Easterby-Smith et al., 1991: 38). The point of ethnography is to study and understand the cultural and symbolic aspects of behaviour and the context of that behaviour, whatever the specific focus of the research which is typically a case. In addition to this, six related important characteristics determine ethnography:

(1) Ethnography starts from the assumption that the shared cultural meanings of the observed group are crucial to understand its behaviour
(2) The ethnographer is sensitive to the meanings that behaviour, actions, events and contexts have
(3) The case will be studied in its natural setting
(4) Ethnography is likely to be an unfolding and evolving sort of study, rather than pre-structured
(5) Data collection techniques are eclectic, not restricted

(6) Data collection will typically be prolonged and repetitive (Punch, 1999: 160-161).

The researcher was part of the portal project team working within DCXnet. This ensured not only a very good access to data but also allowed for a better understanding of the context and the interactions of all actors. As a result, an extended and detailed study over a period of six years, two years full-time on the project followed by interviews done one-and-a-half years later after the portal pilot went live, and the subsequent research, could be conducted.

3.4.2 The semi-structured interviews

In Table 1, the interview guidelines for the semi-structured interviews related to the research questions and the suggested analytical framework are listed.

Table 1. Research questions and topics of discussion

Research question	Topics of discussion
1. What are the factors that shape the emergence of a inter-organisational portal strategy?	▪ What role does a portal strategy play within a corporate business strategy setting? ▪ What factors/actors determine the direction of a portal strategy?
2. What causes the dynamics in developing and implementing a standardised supplier portal?	▪ How are the influences of actors and factors understood? ▪ How do the individual actors influence the different stages of the standardisation life cycle? ▪ How do the single stages influence each other? ▪ What alternatives emerged during the different stages of the standardisation process?
3. How do these dynamics pattern the outcomes? 4. How does local change take part in the wider context of the sector?	▪ What are your individual perceptions of outcomes? ▪ How do these match the expectations? ▪ If there is a gap and, if so, what do you think is the principal reason for this?

3.4.3 Analysis of the semi-structured interviews

According to Miles and Huberman (1994), a summary-aided approach is useful to analyse the data of semi-structured interviews (see Figure 11).

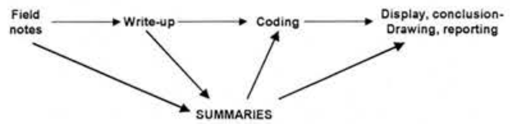

Figure 11. Summary-aided approach to analysis (according to Miles & Huberman, 1994: 79)

Field notes and their write-ups should be reduced in the respective summaries. This also helps preparing coding and the drawing of conclusions. As contemporary social sciences are likely to use semi-structured interviewing, the data gathered needs interpretation in combination with reasonably extensive observation of actual social situations (Blaikie, 2003). To get the collected data into a form suitable for analysis, data reduction techniques such as coding frames have to be established as data from open questions require a set of coding categories (e.g. Oppenheim, 1992; de Vaus 1995, in Blaikie, 2003: 235).

In Table 2, the interview partners from different companies are listed.

Table 2. Interviewees

Actors	**No of actors**	**Interview partners**	**No of interviewees**
OEMs	4	▪ Strategic department B2B ▪ IT department ▪ Business units (procurement, logistics)	6 2 2
Suppliers	6	▪ Business representatives ▪ Administrators, users	8 2
Covisint	1	▪ Business representatives ▪ Technical experts	1 1
SW Provider	2	▪ Technical experts	2
Other	2	▪ Consultants	2

3.5 Benefits of the research

This research is relevant both for academia and industry. For academia, with the suggested analytical model, a framework is available that aims to analyse the dynamics of standardisation. The case is an interdisciplinary and longitudinal study consisting of an unusual combination of social, technological and economic theories. The different strands of existing research are linked together in order to achieve contributions for a deeper understanding of the dynamics of standards development and implementation of inter-organisational networks and systems.

For practioners in companies, this thesis helps to understand the issues of developing and implementing standardised IONS from both perspectives the micro and the meso level. With the practical relevance of the chosen topic and the results found, interested companies facing the same situation could benefit from the description of the project and the related issues discussed. According to feedback from international paper reviews and conferences, this socio-technical analysis of standardisation in IONS from a social shaping perspective is one of the rare studies that investigated ICT in its context.

The longitudinal and contextualised single-case study approach was chosen to explore the portal implementation case from a SST perspective because it turned out to be an exceptionally detailed case with much information. During the project I occupied a dual role both as actor and as a participant observer, which had its benefits and downsides. On the one hand, it offered the unique chance to get access to rich and valuable information and data to create a rich knowledge base. On the other hand, as actor I was part of the system that framed my writing. It is difficult to track back some of the information sources, for example. I cited sources wherever it was possible, but had to interrogate carefully my commitment and position.

Data collection tools such as ethnography, project documentation and semi-structured interviews were used. The value of the research in terms of validity and generalisibility was assured by reviews of submitted conference papers and journal articles. Eventually, the thesis is valuable for praxis and academia due to more than

13 years of personal working experience in procurement and logistics, and more than seven years in e-business.

Chapter 4. CASE STUDY CONTEXT

4.1 Introduction

This chapter aims to provide the context of the study. With respect to portals as tools to support and bridge inter-organisational processes between car manufacturers and suppliers, the focus of this chapter is to describe the automotive environment, starting about around 120 years ago. Beginning with a historical perspective in the next section, the industry of today and its actors are described as being reshaped tremendously by technological changes and enormous market pressures. All those changes are explained in section 4.3. Their outcomes influenced the ways Original Equipment Manufacturers (OEMs) and their suppliers are structured internally, and co-operate today.

For about two decades, the automotive sector has been using IONS systems, starting with EDI for the exchange of real-time information, mainly in logistics. With the advent of Internet-based technologies a wider range of possibilities enables the support of business processes between an OEM and its supply base. Portal technology in particular enabled not only the exchange of information, for example in logistics, but supported most of the business processes during the manufacturing of a car. Portal technology allows for collaboration between OEM and suppliers across company boundaries. To facilitate cross-company activities, electronic marketplaces (e-markets) as intermediaries entered the market; for example Covisint hosted both the supplier portal investigated here, as well as the major competitor SupplyOn.

Most of the study was done at DaimlerChrysler (DC), an overview of which is subsequently provided. As mostly the Global Procurement & Supply department (GP&S) was responsible for the supplier portal project, this department is also briefly introduced. The chapter concludes with a brief summary.

4.2 (Hi)story of the automotive industry - an evolutionary reflection

"The Model T Ford is being available in all colours - as long as it is black"
(Ford & Crowther, 1922: chapter IV).

4.2.1 The birth of the Automotive Industry

The automotive industry has already been studied in the past regarding technological change (e.g. Abernathy, 1978; Whipp & Clark, 1986). A brief review of the historical events will provide the context to describe the massive changes in the automotive market and the subsequent changes in the whole industry.

Originally, the automotive industry had its roots in European countries such as Germany[4], France and the United Kingdom. Additionally, the US were a big player, but entered the market at a later stage. In Europe, from about 1880 until 1908, cars were manufactured through craft production rooted in the rich industrial experience that had existed in Europe for over a century (Lamming, 1993). Craft production was characterised by a highly skilled work force in design, machine operations and fittings. Many of the workers progressed from apprenticeship to posses a full set of craft skills and were then able to run their own workshops, and so become contractors to assembling companies. Companies were extremely decentralised; most parts of a car came from small workshops. The owner coordinated everyone involved – customers, employees and suppliers. General purpose machine tools were performing operations for very low production volumes: 1,000 or fewer cars per year, only a few of which were built to the same design. Out of 50 no two were exactly alike since craft techniques inherently produced variations (Womack et al., 1990: 24).

Whereas in the first years of the industry the market was populated by hundreds of small firms each producing only a small number of cars, the situation changed dramatically when Henry Ford started to manufacture his famous

[4] Piore and Sable (1984) point out that craft production remains at the heart of German manufacturing.

"Model T". The main characteristics of the Model T included the reduction in complexity and number of components (standardised component manufacturing) in order to make assembly easier. This was the start of mass production. Changes in the product design were triggered by both the market - 'a universal car for the common man' - and by technology (Lamming, 1993). With advances in machine tools, Ford was able to develop innovative designs with a reduced number of parts and he made these parts easy to assemble.

According to Chandler (1964), the idea of interchangeable parts was not new, but Henry Ford was the first person who fully applied them in the automotive industry. This reduction in complexity represented a cost reduction in the manufacturing process and improvements in quality. However, this had significant consequences for the suppliers because fewer parts meant fewer suppliers and larger and more sophisticated parts meant more demanding challenges for suppliers (Lamming, 1993: 4-5). The Model T gave the Ford a dominant position in the industry.

By 1926, other car companies such as Chrysler or General Motors (GM), led by the legendary Alfred P. Sloan, joined the bandwagon and overtook Ford's market share. GM pioneered the organisational innovation of decentralised operating entities linked through communication and reporting systems. Additionally, they provided the market with a range of car brands which were part of a larger corporation (Abernathy, 1978). GM also took a different approach in terms of collaboration with suppliers. Ford's view of them was characterised by mistrust and close technical control, eventually leading to a vertical integration/in-sourcing of suppliers. Sloan decided not to operate in component manufacturing, but rather rely on external suppliers and outsource as much of the manufacturing as possible.

4.2.2 Cars enter the world

From 1907 to 1924 the British market expanded more than tenfold whereas the US market increased seventy fold in the same period (Whipp & Clark, 1986). In a phase of industry transformation, the North American 'big three', Ford, GM and Chrysler, exported mass production to the whole world. In Europe, they opened plants in England in 1911, in Australia in 1925, and they set up 'completely knocked down' (CKD)[5] assembly operations kits in Japan. Due to the adoption of the deskilling processes of mass production, many craft companies disappeared and European automotive engineering gradually became history. As Womack (1988) summarises, mass production is characterised by high scale mechanical components produced with single-purpose machines, specialisation in work tasks, concentration on manufacturer level and vertical integration of the final assembly manufacturing. This requires the coordination of complex processes with multiyear lead times and large capital investments (Lamming, 1993; Womack, 1988: 303).

In Europe, the years between 1930 and 1980 were characterised by the adoption of the American mass production system. For example, in Germany large scale production appealed to the industrial engineering professionals (Lamming, 1993: 12). As American cars were unsuitable for the European market (due to for example, size, different European countries having different tastes and different economic circumstances) a plethora of design experiments emerged (Altshuler et al., 1984: 21). Additionally, protective tariffs prevented the large-scale export of American cars to Europe. After these tariff barriers for export to the US were removed in the 1950s and 1960s, Europeans sold their smaller cars to the US. In modifying the mass production concept, they achieved economies of scale and consolidated their progress in product innovation. About six car manufacturers produced cars in high volumes, in addition to half a dozen manufacturers of luxury and performance cars.

Suppliers had gradually developed into a technologically sophisticated component industry and experienced lower levels of vertical integration than before (Womack, 1988: 304). European suppliers had their origins in highly skilled craft-based companies. Some of them, for example the Zahnradfabrik

[5] Completely Knocked Down (CKD) means the entire decomposition of a car in its country of origin and the subsequent assembly in a country where for example it is forbidden to import a complete car or customs hamper imports (high tariffs).

Friedrichshafen (ZF), were involved in technological innovations like airships, and Bosch worked on control systems. These type of suppliers were unaligned, not depending upon a specific car manufacturer. Due to political reasons, a strong national identity played an important role in terms of collaboration between suppliers and car manufacturers. In Germany, for example, a huge and influential industry association "Verband Deutscher Automobilindustrie" (VDA) was founded and aimed to knit German suppliers and car manufacturers together (see also 4.3.1.).

4.2.3 A new player changes the auto production game

The next transformation of the automotive industry was largely triggered by the market entrance of Japan, strongly related to their approach to improve mass production, and subsequently the influence this had on the established mass market manufacturers. In the 1950s, the Japanese Ministry of International Trade and Industry (MITI) severely restricted foreign investments and forced twelve domestic car companies to coordinate their product offerings to achieve economies of scale. Thus, MITI's policies clearly helped the Japanese car manufacturers joining the global automotive industry (Lamming, 1993: 17).

According to Womack et al (1990), the Japanese post war economy could be described as tiny, war-ravaged, starving for capital and foreign exchange, and requiring a wide range of vehicles. In the mid-1950s, Japan entered the American automotive market where the well established car manufacturers feared losing their market share and sought to defend themselves against Japanese exports (Womack et al., 1990: 49-50). Their fears were absolutely justified. Thanks to their poor economic situation, the Japanese car manufacturers realised the mismatch between mass production and product differentiation, which seemed to be a fundamental market feature. This need for innovative thinking paved the way for 'Just-in-Time' (JiT) and 'lean production'.

In the late 1970's and early 1980's, the Japanese car industry became exemplary for JiT. The JiT concept emerged as a dramatically new approach to executing all activities on the plant floor. The primary focus of JIT centred on a "pull" approach where all upstream manufacturing activities were linked and controlled by the activities of the next down-stream operation. The down-stream operation would physically send distinct and direct signals to the prior upstream operation in the form of "Kanban"[6] or card signals directing that operation to respond to its needs for product or service. In essence, this approach can be classified as a "process-driven" philosophy.

Starting in the late 1980's, "Lean Production" was introduced by the US as a response to the Japanese market power. Womack et al. (1990) have summarised what happened in their book 'The Machine That Changed The World'[7]. Lean production encompassed not only a new way of manufacturing[8] but also a corporate strategy and integration model. The new way of production included JiT concepts, pioneered by Toyota and incorporated in the 'Toyota Production System' (TPS). The TPS consisted of a number of specific techniques such as *kaizen*[9] and *heijunka*[10], and took advantage of additional quality management techniques (Womack et al., 1990). These specific techniques were a fundamental part of a global manufacturing strategy built upon the benefits of JIT production, and total quality management. Toyota is reported to have no re-work areas, and lean production extended to development and design cut down development time to half (Womack et al., 1990). The integration of suppliers was shaped by regulatory rules and historical developments. The MITI set up rules to form a tightly-knit subcontracting structure which was translated (by

[6] Kanban is a signalling system. Kanban uses cards to signal the need of an item in the store.
[7] The book focuses on the comparisons of different new emerging concepts that we now know as the Lean Enterprise. It was at this point in the manufacturing cycle where dramatic changes began to evolve into what we now recognise as 'Lean Production'.
[8] Womack et al. (1990) and Lamming (1993) refer to it as 'production paradigm'.
[9] In Japanese *kaizen* means literally "improvement"; is an approach to productivity originating in applications of the work (http://en.wikipedia.org/wiki/Kaizen, as of 11th of December 2005). The Toyota Production System (TPS) is known for kaizen, where all line personnel are expected to stop their moving production line in the case of any abnormality, and suggestions for improvement are rewarded.
[10] *Heijunka* is the act of levelling the variety and/or volume of items produced at a process over a period of time. Heijunka is used to avoid excessive batching of product types and/or volume fluctuations, especially at a pacemaker process (http://www.leanadvisors.com/Lean/glossary/definition.cfm/Word/Heijunka.cfm).

Toyota and others) into a purchasing policy that clearly defined which group of suppliers should be taken for general purchasing, special purchasing or special factory purchasing (Nishiguchi, 1989).

Additionally, after the Second World War, new industry structures emerged, known as 'keiretsu', consisting of a number of clusters of companies without a single leader company (Lamming, 1993). The role of Japanese car manufacturers was on the one hand characterised by the support of suppliers in order to help them set up and operate their businesses. On the other hand, the car manufacturers wanted to prevent the same suppliers from dealing with Western customers and tried to take control. Western mass producers tried to adapt to the lean ideas of process improvements and supplier integration. Unsurprisingly, they made some painful experiences. Today, the Japanese car manufacturer Toyota is still the number one in benchmarking studies of the industry, and is watched by competitors worldwide. The automotive industry in total has adopted a mixture of older concepts such as (JiT) and Just-in-Sequence (JiS), and new ideas such as the optimisation of inter-organisational processes between business partners in order to adapt to the changing market requirements. These new ideas are discussed in the next section.

4.3 The automotive industry today

This section gives an overview of the current situation in the automotive industry. After an introduction of the actors who populate the sector (including its structure), current trends that massively influence this industry are presented. In the subsequent section the core process of manufacturing is explained, as well as some of the concepts aiming at both improvements in production efficiency and responsiveness to customer needs.

4.3.1 The automotive arena and its actors

In an era characterised by marketing, mobility and environmental sustainability, the automotive industry still fascinates. One of the reasons might be that it is an industry that has undergone huge transformations in terms of market, products and distribution channels; this is illustrated in Figure 12.

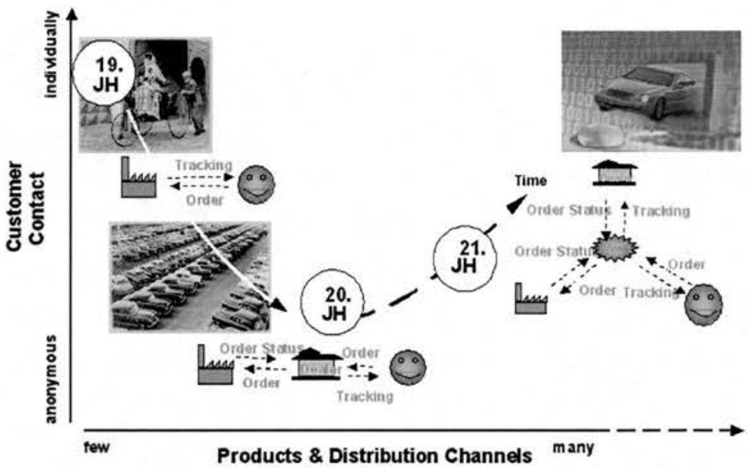

Figure 12. The evolution of the car business (DC presentation)

In the early days craft production gave customers the advantage of a bespoke product. A wide variety of personal tastes and requirements could be accommodated. Interestingly, automotive companies had to undergo three transformations within about 100 years to once again appreciate the importance of customer preferences. Today, a car is manufactured according to the so-called "Build-To-Order" (BTO) concept (see section 4.3.4.), based largely on the customers' needs - all car companies have focused their business strategies on the customer again.

Overall, a continuous growth of the global car production can be observed. In 2003, almost 60 million cars were manufactured in the five different economic regions the European Union, Eastern Europe, NAFTA (US, Canada, Mexico), Japan, and 'Rest of the World' (RoW). Three main categories of actors populate the automotive industry arena: (1) OEMs, (2) suppliers and (3) industry associations (e.g. VDA, ODETTE, AIAG).

(1) Original Equipment Manufacturer (OEMs)

In the automotive industry, one can differentiate between the first equipment manufacturers, the so-called Original Equipment Manufacturer (OEMs) and the aftermarket (Adolphs, 1996). In this study, the focus is on OEMs. The landscape of OEMs has changed dramatically in the past decades. From 36 OEMs in 1970, only about 20 companies have survived (see figure 13 below). At the same time, the number of variations of a car model increased dramatically; for example the BMW 3 series comes in a number of different petrol engines (horsepower), as a common rail diesel model, as a convertible as well as an off-road vehicle .

With the growth of outsourcing, an increase in skills to manage large supplier networks has emerged, for example during product development. Naturally, these trends have a huge impact on the business partners of OEMs, the suppliers. Suppliers also have to redefine their roles, for example by shifting to integrated competencies. In re-thinking their business strategies, OEMs have started to shift downstream, for example by extending their service models (by e.g., offering financial services). Finally, sales are under continuous and increasing pressure due to changing customer demands and an increasing competition which leads to price wars.

As illustrated in Figure 13, General Motors (GM) and Ford are followed by Toyota and DC in respect to turnover.

Konzern		Land	Umsatz[2]	Rendite[3]	Markt-erwar-tung[4]	Rang (nach Umsatz)
General Motors		USA	185.524,0	5,52	8,15	1
Ford		USA	164.196,0	2,75	5,50	2
Toyota		JPN	151.013,8	7,54	3,46	3
DaimlerChrysler		DEU	147.531,2	1,39	3,72	4
Volkswagen		DEU	92.486,5	2,07	0,68	5
Honda		JPN	74.445,7	8,92	3,27	6
Nissan		JPN	64.419,1	14,50	4,42	7
Peugeot		FRA	63.501,5	4,97	0,36	8
Fiat		ITA	54.315,5	-1,97	3,32	9
BMW		DEU	47.866,9	5,39	4,25	10
Renault		FRA	42.618,8	1,18	-4,81	11
Hyundai		KOR	38.297,9	9,16	7,62	12
Mitsubishi		JPN	35.431,4	5,77	1,27	13
Mazda		JPN	26.596,1	-1,88	3,68	14
Suzuki		JPN	20.055,5	5,88	2,93	15
Fuji Heavy Industries		JPN	13.128,3	3,52	2,40	16
Kia		KOR	13.049,9	8,42	7,00	17
Isuzu		JPN	13.045,2	-0,47	4,69	18
Yamaha		JPN	9.305,2	5,88	2,92	19
Daihatsu		JPN	9.062,1	-0,36	2,69	20
Porsche		DEU	6.728,3	14,68	10,97	21
Harley-Davidson		USA	4.624,3	20,10	11,89	22
Astra International	-	IDN	3.267,8	10,08	10,71	23

Figure 13. International comparison of OEMs (manager magazine as of 14/02/05)

These four companies are leading the industry in terms of market share; the fifth, VW, only achieves half the turnover of GM. This shows a high level of concentration. Cars are sold by exclusive dealer networks. In Europe, this will change in the coming years due to a decision of the European Commission on an EU guideline known as "block exemption regulation", and will allow dealers to sell more than one brand.

(2) Suppliers

As shown in Figure 14, the supplier segment is highly dominated by US and Japan-based companies. In 2004, the top five suppliers had a market share of about 40% with a turnover of more than € 120 billion.

Automobilzulieferer im internationalen Vergleich[1]

Konzern	Land	Umsatz[2]	Rendite[3]	Markt-erwar-tung[4]	Rang (nach Umsatz)
Delphi	USA	28.096,0	5,50	5,71	1
Denso	JPN	23.370,1	4,43	2,29	2
Johnso Controls	USA	22.646,0	10,47	6,89	3
Bridgestone	JPN	21.012,5	5,35	4,59	4
Michelin	FRA	18.526,0	3,27	4,13	5
Visteon	USA	17.660,0	-2,96	1,26	6
Lear	USA	15.746,7	14,74	8,89	7
Magna International	CAN	15.345,0	8,80	6,29	8
Goodyear	USA	15.119,0	1,51	4,75	9
Aisin Seiki	JPN	14.640,4	2,70	2,39	10
Continental	DEU	13.903,0	5,70	6,74	11
Faurecia	FRA	11.891,4	5,10	3,99	12
TRW Automotive Holdings	USA	11.351,0	8,64	9,59	13
Valeo	FRA	11.130,2	4,13	3,51	14
Toyota Industries	JPN	10.619,5	3,17	0,69	15
Toyota Auto Body	JPN	8.139,2	3,01	1,01	16
Dana	USA	8.020,0	6,32	6,84	17
Arvinmeritor	USA	7.788,0	7,32	5,02	18
GKN	GBR	6.117,9	3,01	6,64	19
Calsonic Kansei	JPN	5.647,3	4,37	1,45	20

Figure 14. International comparison of the 20 major suppliers (manager magazin, as of 14/02/05)

Suppliers have also seen a massive concentration at the horizontal level during the past decades. Between 1989 and 1992, more than 100 mergers took place in the German Automotive supplier community (Wildemann, 1994), such as the merger of Varta (batteries) and Bosch (Adolphs, 1996). Automotive suppliers belong to a range of industries such as, for example, textile, metal, steel, chemistry, electrics, electronics, plastics, etc..

(3) Automotive associations

Automotive industry associations exist at national, European and international level. Examples include VDA, ODETTE and the AIAG described below:

- **Verband Deutscher Automobilindustrie** (VDA)[11]: Founded in 1901 as Verband Deutscher Motorfahrzeug-Industrieller (VDMI). German association, comprising car manufacturers and their suppliers. Facilitator of common project specific working groups.

- **Organisation for Data Exchange by Tele Transmission** (ODETTE): Founded 1984, a non-profit organisation of the automotive industry. Development of tools and recommendations to improve the flow of goods, services, product data and business information across the whole supply chain, throughout the entire product life-cycle.

- **Automotive Industry Action Group** (AIAG): Founded in 1982, AIAG is headquartered in Southfield, Michigan. It has more than 1,600 member companies, including North American, European and Asia-Pacific OEMs and suppliers to the automotive industry with combined annual sales of more than $850 billion. A not-for-profit association, AIAG's primary goals are to reduce cost and complexity within the automotive supply chain and to improve speed-to-market, product quality, employee health-and-safety and the environment.

Those associations represent the interests of the automotive community, for example in promoting communication standards for both OEMs and suppliers.

4.3.2 The relationship between OEM and suppliers

The reasons for the evolution of the "OEM - supplier relationship" are manifold. This evolution has not been stabilised and forces a tighter collaboration between not only OEMs and suppliers but also between other business partners that are

[11] Translation into English: German Automotive industry association

part of the automotive value chain. The boxes at the top of figure 15 show that in the 1980s the relations between an OEM and all its suppliers were similar, whereas in the 1990s this changed to favour a "tier structure" due to the adoption of for example the manufacturing concept JiT.

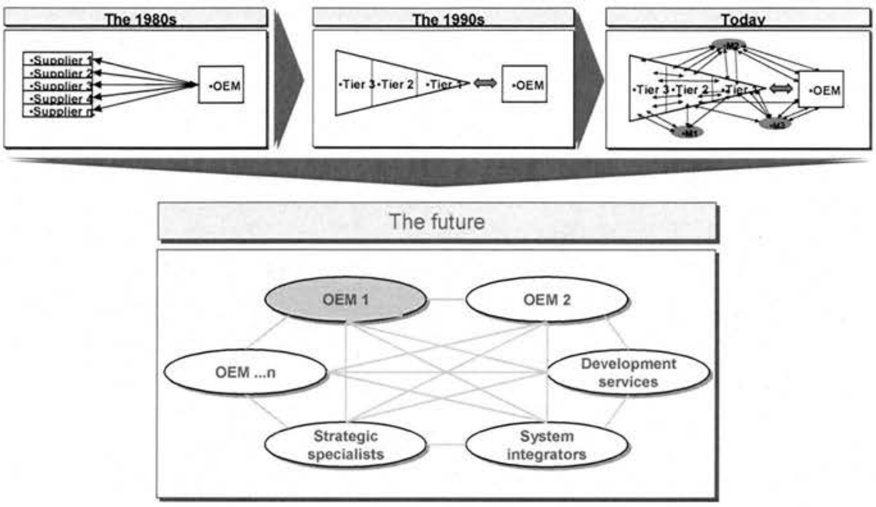

Figure 15. Automotive networks determine future collaboration (BMW)

The main collaboration partners for OEMs have been the tier-1 suppliers which in turn collaborate with the tier-2 suppliers, and so on. Today, due to the demanding market, OEMs are not only collaborating with their supply base but also with other business partners, for example system integrators. The relations between OEMs and their suppliers are expected to change dramatically in the future. OEMs are redefining their business strategies and their core competencies, and consequently are pushing for more outsourcing in all parts of the value chain.

The progressive concentration of suppliers was emphasised in an interview recently given by the CIO of DC, Susan Unger, who made the point that

> *"100 years ago we even produced steel ourselves. Today, we only coordinate a network of more than 100 specialised suppliers and concentrate our business on our core competencies – engineering,*

manufacturing, sales and services of our brands" (*manager* magazine, as of 18/02/05).

The modern approach to outsource and modularise influenced the relationship between OEM and supplier. It created a pyramid-like structure of supplier companies along the value chain, shown in Figure 16 (Adolphs, 1996).

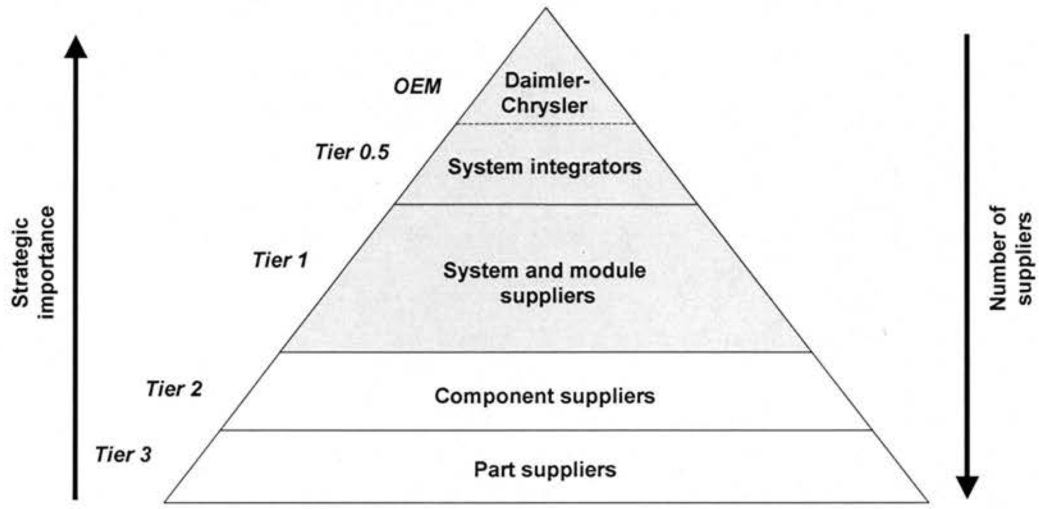

Figure 16. Automotive OEM-supplier pyramid (Dornier et al., 1998)

Going down the pyramid, the number of suppliers increases while the level of strategic importance for OEMs decreases. This development of the OEM-supplier relationship came with the JIT production paradigm.
Depending on the systems and modules supplied to the OEMs, suppliers can be categorised as follows:

- **System integrators – tier 0.5**: engineering and systems integration responsibility and management of entire supply chain of OEMs. Also, increasing share of risk. Design, development, manufacturing of automotive systems, modules and components, and assembly of complete vehicles. Currently, due to limited manufacturing capacity, only a few tier 0.5 suppliers are strategic partners of OEMs. One example is Magna Steyr, Austria, who manufactures whole models for DC and BMW.

- **System and module suppliers -Tier 1**: solution and development partner in engineering, with product and manufacturing know how. Modules are characterised by a special integration capacity. The module supplier takes over the pre-assembly of special components for the OEM. Suppliers' competencies are focused on logistics and assembly. The only difference between systems and modules is the additional R&D effort to be associated with systems. The supplier is responsible for problem solving, and for all parts. Example: braking systems, driver assist systems. Sample companies are Webasto (roofing), Brose (brakes), or Bosch (valves).

- **Component suppliers – Tier 2**: a component supplier is a manufacturing specialist with competences in methods and procedures. Components consist of special OEM requirements. A component supplier for example is Faurecia (seats).

- **Parts suppliers – Tier 3**: parts supplier manufactures predefined products and procedures, execute work-intensive activities and have special know-how at the production level. Parts are characterised by a high level of standardisation (in procurement language this is the so-called "commodity"[12]). An example is Freudenberg (sealing).

Up to now there is no common definition available in the automotive industry for systems and modules (FHI, 1994). Each OEM has a different understanding of a system or a module. For DC, for example, a system is a consolidation of several single elements. Criteria that allow for consistent checks include, for example, functionality or technology. Systems have different levels of complexity. They embody product-related and an added value-related dimension (Schindele, 1996).

[12] Commodities are parts which are easily replaceable regardless of the supplier.

In the book *"Beyond Partnership – Strategies for Innovation and Lean Supply"*, Lamming (1993) argues that a successful positioning of suppliers depends upon the nature of the relationship between them and their OEMs. A successful relationship is characterised by a complex range of factors that *"build to an effective, supportive communication channel"*. Without it, the necessary collaboration on processes and product development cannot be achieved (Lamming, 1993).

4.3.3 Characterisation of the automotive industry

Currently, the automotive market is characterised by several trends as pictured in Figure 17.

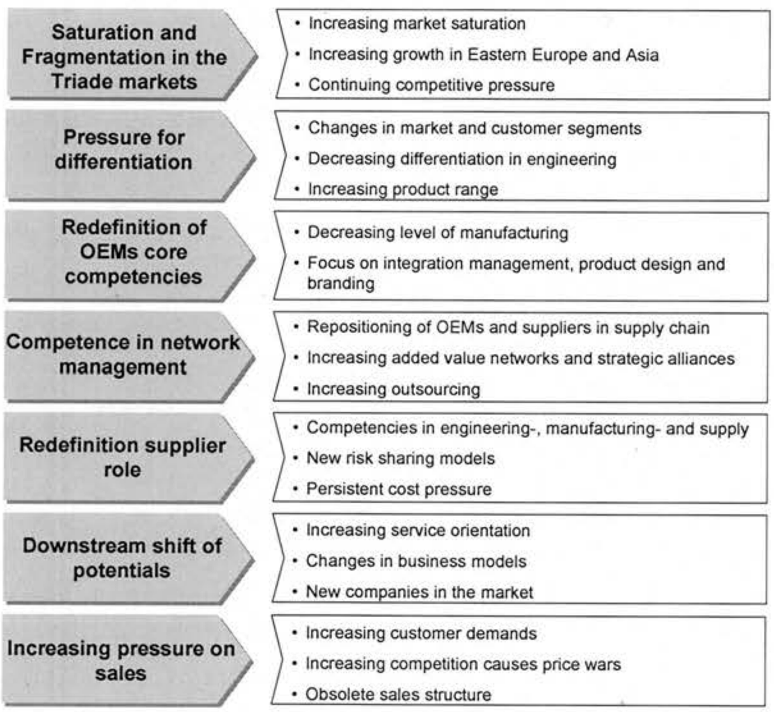

Figure 17. Current characteristics of the automotive industry (McKinsey, 2003)

One of these trends is the saturation and fragmentation of the three large markets of US/Canada, Europe and Asia. The increasing growth of markets in Eastern Europe and Asia, stagnant markets elsewhere, and a continuous competition complete the picture. The pressure for differentiation is another trend. Consequently, this leads to a redefinition of OEMs' core competencies, characterised by an increase of outsourcing and marketing activities to push the brands.

Apart from changes of the nature of the relationship between OEMs and suppliers, the industry is confronted with a number of transformations that challenge the established relations between industry players. The automotive industry is characterised by extremely complex processes and the standardisation of processes, and data is inevitable in order to meet production requirements. Driven by challenges such as shorter product life cycles, increasing cost pressure in stagnant markets and higher complexity of the electronics embedded in modules and systems, OEMs gradually increase the outsourcing of manufacturing, which is expected to rise from 25% up to 35% within the next 10 years (McKinsey, 2003).

The supplier community is also undergoing strong shifts as the result of these pressures. Increasingly, platforms and model varieties require advanced project management capabilities. That is, in terms of innovation, management suppliers have to be able to provide leading-edge technology and efficient simultaneous engineering processes. This change primarily affects the tier-1 suppliers who are taking over systems integration responsibility and management of the supply chain from the OEMs. At the same time, they also take an increasing share of risk. As a result, the industry is forced to collaborate more closely. This means a repositioning of both OEM and supplier in the supply chain. As more and more competences in engineering, manufacturing and supply are handed over to some of the suppliers (who experience a totally new role), the OEM needs employees who have the ability to manage networks. A redefinition of OEM and suppliers also influences the level of service orientation and leads to completely new business models and new market players. Finally, the increasing pressure on production also affects sales. Dealers have to fight against price dumping by competitors and have to rethink their sales structure.

4.3.4 Manufacturing processes of a car

The production of a car is a well defined sequence of processes. The core processes of the automotive value chain can be identified by using Porter's value chain model (Porter, 1984), illustrated in Figure 18.

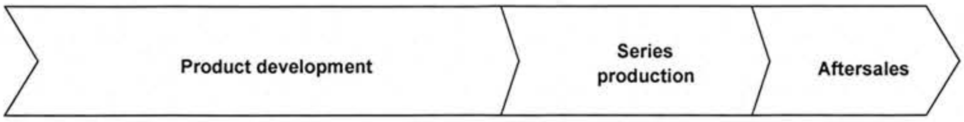

Figure 18. Core processes of the automotive value chain (Schindele, 1996)

The automotive supply chain consists of three main phases, the product development phase, the series production and the after-sales phase.

Product development – characterised by four phases which include (1) strategy, definition of top-down and bottom-up goals and allocation strategy of parts, (2) technology, selection of technology matched with suppliers' selection, (3) prototyping, which requires controlling of budget and (4) starting, which includes type series reporting.

Series production – characterised by change management and performance optimisation in redefining goals, controlling volumes and type series.

After-sales – provides the aftermarket with parts until end of production.

Concepts of car manufacturing

Driven by challenges such as shorter product life cycles, increasing cost pressure in stagnant markets, and increasing technological complexity, the automotive industry is currently facing increasing demand for rapid innovation in order to meet the customers' needs, reduce costs and stay competitive (McKinsey, 2003). To this end, OEMs have changed their concepts of manufacturing and collaboration models with suppliers. Today, catchwords such as BTO, JiT or JiS are commonplace to reflect new approaches to manufacturing and collaboration between OEMs and suppliers.

For the past few years, the automotive industry has been putting in place a number of measures to respond to increased customer needs. In contrast to the traditional "built-to-stock" (BTS) model, where cars are produced on stock, the BTO enables to manufacture a car according to individual customer requirements. BTO, for example, is leveraged by new Web-based communication and transaction technologies, such as supply chain planning and supply chain execution tools in order to ensure seamless production.

This allows car makers to better respond to customers who are increasingly more knowledgeable, and demanding about their preferred vehicle configurations. However, this method requires that OEMs are able to accurately forecast demand. This may be achieved using Internet-based technologies that allow for continuous monitoring of the supply chain. This approach enables OEMs to operate with lower inventory levels, relying on their supply chain to deliver the parts they need to build cars. The parts do not arrive before they are required. JiT is a concept to minimise cost and increase efficiency, productivity and quality through economies of scale and control (Womack et al., 1990). Today, JiS is the more common procedure than JiT. With JiS systems and modules are delivered directly by suppliers to the assembly line in the exact order in which they are to be incorporated into a car.

As the market changed dramatically in the past 20 years, the business relations between the main actors, OEMs and suppliers, have also changed significantly, reflecting a change in the needs of the more powerful OEM. Today, OEMs are forced to manufacture a large range of different car types. However, they have major difficulties to satisfy customers expecting their car to be ready at the promised day. OEMs and their suppliers have to collaborate, for example, in the exchange of data to avoid out-of-stock situations. Margins are shrinking for both and they have to collaborate closer because otherwise they are either out of business or bought by a competitor. Since the 1960s, collaboration has to a large extent been influenced by Information and Communication Technologies (ICT). After the introduction of the Internet and related technologies, the "industrial everyday manufacturing life" cannot be pictured without these technologies.

4.4 Collaboration supported by IONS

Today, the automotive business is unimaginable without ICT. Particularly IONS have been adopted to increase the efficiency of cross-company collaboration.

Christiaanse et al. (2004) understood electronic markets as referring to all kinds of inter-organisational arrangements involving multiple firms. Within this conceptualisation, electronic markets are defined as *"electronic networks where buyers and sellers meet to engage in buying and selling as well as other activities, such as collaborative planning, logistics, transportation arrangements and fulfilment"* (Christiaanse et al., 2004: 152). This conceptualisation differs from earlier studies, which have looked at electronic markets as a matter of buying and selling (Bakos 1991). This emphasises a change from a purely transactional focus (Bakos 1991, 1997; Malone et al. 1987) to a relational one. Electronic markets are thus seen as concerned with supporting collaboration functions (e.g. supply-chain management solutions, fulfilment, trust mechanisms) between players rather than just as an exclusive focus on the sale transaction and price (Christiaanse et al., 2004).

Such IT systems are adopted not only to achieve operational effectiveness by reducing co-ordination costs and transaction risks, but also to improve communication and information presentation, and to enhance the collaboration between OEMs and their suppliers. An example of such IT initiatives is the development of electronic markets, for example Covisint or SupplyOn. E-markets were seen as the industry's most promising initiative to adapt to changing market conditions and cost pressure, and to facilitate inter-organisational collaboration between industry players. They were supposed to boost profitability and reduce transaction costs by providing a transparent, flexible and collaborative structure.

4.4.1 The need for collaboration between OEMs and suppliers

The automotive industry is characterised by vertical integration in terms of the business relation structures between OEMs and suppliers (Adolphs, 1996). A current trend in manufacturing is that OEMs attempt to cooperate with fewer suppliers, but on a worldwide scale. As a result, small and medium sized suppliers will be suppliers to integrators – that is, tier-1 or tier-2 suppliers – rather than directly to the OEMs.

In practice, the term 'collaboration' replaced the formerly-used term 'cooperation'. A reason might be that cooperation is increasingly facilitated by IT underpinning the dynamic character of cooperation, and leading to "real" collaboration. Dyer et al. (1998) distinguished between 'arm's length' relationships and 'strategic partnerships' depending on the product or service purchased by the OEM. From the OEM's perspective, collaboration certainly relies on partnerships with those suppliers that are classified as 'strategic' (depending on pre-defined criteria such as priority of the product delivered, reliability or quality) (Dyer et al., 1998). However, in theory, according to Lambe et al. (2002), collaborative partnerships are those in which:

- both sides believe that their own investments are substantial
- each recognises the substantial investments of the other
- both sides believe that they themselves would face difficulties accessing alternative partners and
- each believes that the other would face costly consequences if the established relationship were terminated (Lambe et al., 2002)

To support collaboration between OEMs and suppliers in the automotive industry IT tools such as IONS are used. Portal technologies also belong to this group of Internet-based systems. They support an efficient and user-friendly collaboration of different business partners, and enable the integration of all types of different information systems in the car industry.

4.4.2 IONS in the automotive industry

The importance of IONS has been increasingly recognised by companies in the automotive industry. However, since the times of early EDI systems, the adoption has proved to be difficult in the past decades. Whereas the objective of EDI was to exchange recurring information with a handful of preferred suppliers, portals made the adoption of a network of suppliers a goal of OEMs.

In this section, the adoption of (1) EDI as one of the first IONS and (2) portals in the automotive industry are discussed. This is followed by a discussion of a couple of issues during portal implementation. Finally, in (3) a comparison of EDI and portal is presented.

(1) EDI in the automotive context

For more than 20 years, OEMs have adopted EDI to communicate more efficiently with their large suppliers. Using EDI systems, buyers and suppliers arrange routine business transactions such as invoices or delivery notifications. The information used to be exchanged over proprietary communication networks using prearranged formats (Hanseth & Monteiro, 1998).
The Electronic Data Interchange For Administration Commerce and Transport (EDIFACT) format is the most widely accepted standard. EDIFACT messages are defined internationally. Such international messages are often accompanied by specification of national or sector-specific subsets as well as "exchange agreements" between pairs of communicating partners. Such specifications define in more detail how a general message should be used within a region or sector or between specific partners (Hanseth & Monteiro, 1998).

In the automotive industry, there are three organisations that develop EDI standards:

- VDA – EDI standard of the German automotive industry
- GALIA – EDI standard particularly used in the French automotive industry, similar to ODETTE
- ODETTE – EDI standard of the European automotive industry

These EDI standards have been adopted in the logistics area for all sorts of transport messages such as Delivery Instruction, Despatch Advice, or Invoice. In Europe, the most important standard used in the automotive industry is the ODETTE standard. ODETTE started in 1984 with participation by automotive organisations from Benelux, France, Germany, Italy, Spain and Sweden. It aimed at both direct communication between installations and indirect communication via a third party clearing centre. It was developed to facilitate communication within the European motor industry (www.odette.org). In 1998, ODETTE started to migrate from the original Odette EDI format to the UN/CEFACT standard. Although the VDA is a German industry body and ODETTE is a European association, both have close relationships with the international automotive association "Automotive Industry and Action Group" (AIAG).

EDI allowed organisations to integrate their various business processes and enabled the formation of networks of inter-organisational relations. Until the advent of open, cheap and flexible standards-based Internet technologies during the late 1990s, EDI still was the dominant standard in the area of Business-to-Business (B2B) e-commerce. In the automotive industry, for logistic processes such as delivery schedules, EDI still is the dominant standard for communication between OEMs and tier-1 suppliers. Apart from the lack of flexibility inherent to EDI standards, the high costs associated with the implementation and use of EDI meant that only large suppliers could be involved in this IOS; Small and Medium Sized Enterprises (SMEs) were largely excluded.

However, EDI has never achieved the envisaged adoption rate within the industry due to high cost and low fit of supplier requirements. Therefore, new IONS such as portals emerged to provide the technical ability to connect the entire supply base.

(2) Automotive portals and their functionality

A portal is defined as a linked electronic platform with a single point of entry, independent of time and space that enables collaboration through access to multiple sources of information (cf. theoretical background in chapter 2). Portals in the automotive industry were often initiated by large buyers, the OEMs, to facilitate interaction with their network of suppliers. Usually, the initiating OEM has essential needs to be taken into consideration when developing and implementing a portal, particularly in a larger organisational environment. This led to various important aspects of portal functionality to be considered when developing and implementing a portal shown in Table 3.

Table 3. Important aspects of portal functionality

#	Requirements	Characteristics
A	Single point-of-entry	▪ Dynamic and flexible web layout ▪ Registration of users ▪ Help Desk, online help
B	Portal access Structure of websites	▪ Availability ▪ Performance ▪ Navigation
C	User data	▪ Integrated user data management ▪ Authorisation
D	Scalability and integration in existing IT infrastructure	▪ Integration patterns ▪ Standardised processes
E	Security	▪ Authentication ▪ Single Sign-on (SSO) ▪ Encrypted communication

(A) The major motivation to develop and implement a portal in the automotive industry is the availability of a single point-of-entry with real-time access, standardised processes and support services. Portal functionality should provide dynamically generated websites with a corresponding content management system, personalisation features, and integration options for applications. Additionally, standardised processes should support user registration, and a help desk allowing them to find their way through the portal; particularly when using the portal for the first time upon registration.

(B) The next important aspects are the portal's access and navigation structure. Portal design and structure of the portal website directly influence the navigation through the portal. Depending on the performance, the appearance of the portal pages plays a crucial role for suppliers' acceptance when working with the portal. Another key issue that has to be taken into consideration is the availability of the portal; preferably 7/7d and 24h/24h.

(C) A single integrated user data management system is required to manage user data and the use of applications. In practice, user data already exist and have to be integrated into the new portal's user data management system. The availability of advanced authorisation concepts is playing a key role in this context as the authorisation of a user has to be integrated with the authorisation concept of individual applications (which usually have their own authorisation modules).

(D) Scalability and the integration of the portal technology into an existing IT infrastructure are key elements when implementing a portal. Integration patterns and standardised approaches are needed as the portal is usually integrated into the corporate IT architecture (which is difficult enough even if portal functionalities to be implemented are available and sufficient).

(E) Security is a major concern for most companies starting IT enabled collaboration. Therefore, user authentication and individual access to applications (with the so-called "single sign-on" functionality) as well as, in some cases, the encryption of communication are important portal functionalities.

The above mentioned aspects and how they influenced the portal project are described analysed more deeply in chapters 6 and 7.

(3) The comparison of EDI and portals

Despite the implementation of various IONS based on XML, the use of EDI and related standards have not been abandoned (as it was predicted by XML supporters). Table 4 compares the differences between EDI and portals according to a number of criteria such as area of application, degree of standardisation or the level of a business partner relationship.

Table 4. EDI/VDA vs portals

Criteria	EDI/VDA[13]	Portal functionality
Area of application	Logistics	Entire value chain
Degree of standardisation	Standardised messages in a standardised format	Standardised Business processes
Business partner relationship (trust)	Only with tier-1 suppliers	Entire supplier community
Importance of the parties involved (Power)	Dominant players push for technology	Dominant players push for technology
Global	No	Yes
Critical mass	Not reached	Not reached

Portals seem to be the more advanced technology because they could cover the entire value chain. However, OEMs still are a long way from completely moving from EDI to XML-based technologies. EDI is still very much is use in logistics due to high switching cost and the fear of causing a costly interruption in production processes. Another reason is that an OEM's logistics department belongs to the manufacturing plant. Logistic processes are 'production-critical'. In the worst case scenario, changing completely from EDI to XML would mean a stop of production with all associated consequences.

Portals offer a higher degree of standardisation (processes) than EDI messages (content). Another advantage of portals is that they have the potential to connect the entire industry whereas EDI was only attractive for the big suppliers who could invest in EDI hardware and software. Also, EDI is only in place in some areas of Europe, but portals are not subject to any geographic limitations; they

[13] The association VDA has defined EDI messages in recommendations, adjusted for the automotive industry for example VDA 4936 for delivery schedule, order and self-billing invoices (cf www.vda.de).

can be used on a global scale. However, portals as well have in many cases been pushed by powerful OEMs. Unfortunately, those OEMs have not been able to communicate the benefits of a portal to their suppliers. This led to a critical mass issue similar to the one experienced with EDI; the expected number of participants is not reached within the envisaged timeframe.

In the next section, one of the big OEMs, DaimlerChrysler, is described. As a corporation, not only EDI but also portals have been deployed by different Business Units (BU) in order to increase collaboration with their suppliers.

4.5 Electronic marketplaces in the automotive industry

Electronic marketplaces are defined as "electronic networks where buyers and sellers meet to engage in buying and selling as well as other activities, such as collaborative planning, logistics, etc. (Christiaanse et al., 2004). Electronic markets are thus seen as an enabler of supporting collaboration functions (e.g. supply-chain management solutions or fulfilment) between players rather than having just an exclusive focus on the sale transaction and its price. This is exactly how DC understood e-marketplaces: they were seen as tools to achieve operational effectiveness by reducing co-ordination costs and transaction risks, as well as to improve communication with suppliers. Apart from the examples Covisint and SupplyOn described in detail in the subsequent sections, other e-marketplaces in the automotive arena include, for example, AutopartsB2B.com or RubberNetwork.com.

4.5.1 Covisint

In 2000, Covisint[14] (**Co**nnectivity, **Vis**ibility, **Int**egration), temporarily named NewCo[15] was founded by three of the largest OEMs – DaimlerChrysler, Ford and General Motors – and two software companies – Commerce One and Oracle. They commonly announced to join forces and to set-up one single global B2B e-marketplace. Later in the same year, Renault/Nissan joined. The

[14] In 2004, Covisint became part of Compuware Corporation.
[15] NewCo refers to „New Company".

vision behind Covisint, as illustrated in Figure 19, was to enable the interconnection of the entire automotive industry with a single, global exchange marketplace with one single point of entry, standardised business processes and standard applications.

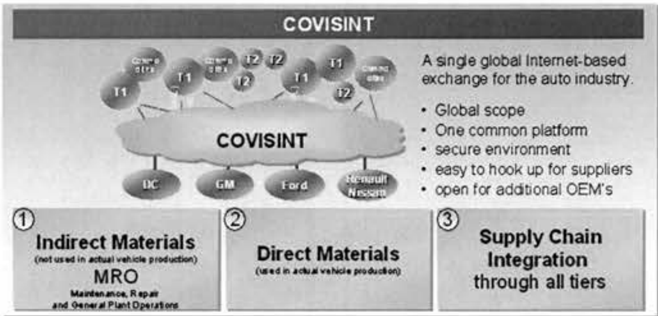

Figure 19. The vision of Covisint (Covisint presentation, 2000)

Covisint aimed to become a *de facto* industry standard for production as well as for non-production goods, and for business process integration for the whole automotive industry with a global scope and in a secure environment. While transferring key business processes onto the Internet, it had been claimed to increase significantly the value and efficiency, transparency and integration of the supply chain. The interconnection of the disparate elements of the industry in a virtual space was meant to speed up decisions, eliminate duplicated work, reducing costs and increase efficiency while supporting common business processes between the OEMs and their supply base (Kandampully, 2003). Therefore, Covisint had been branded as a global and independent e-business exchange for the automotive industry, focusing on products and services in compliance with industry standards. It worked closely with industry bodies such as AIAG. Covisint's business model was based on transaction fees for the provision of services built upon secure B2B e-commerce technology.

Services of Covisint

Covisint provided three types of services: procurement (through the electronic market), supply chain management (such as state of inventory and demand forecast of the supply chain) and collaborative development business (i.e. the Virtual Project Workspace). Standardisation could be achieved across the entire range of services that Covisint offered, for example through the uniform personalised access from any location ('single sign-on') including authentication and authorisation, portal administration with registration, user management, user help desk, integration into existing IT infrastructure and through diverse interaction channels (e.g., integration into backend systems), and standardised e-auction and e-collaboration tools. Figure 20 presents products and services for product development, procurement and supply chain management offered by Covisint. They cover the processes of the entire automotive value chain, from strategic planning to production.

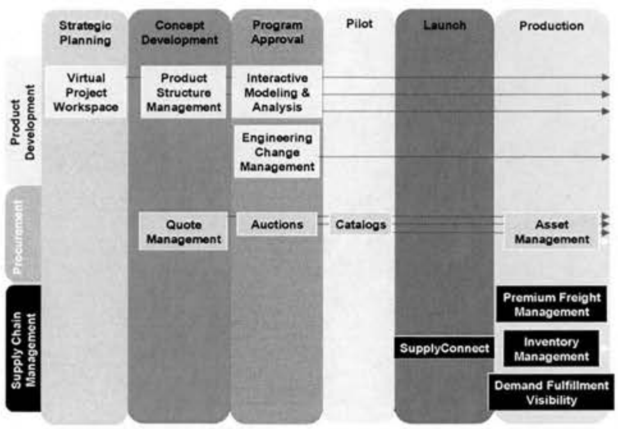

Figure 20. Covisints product and service offer (Covisint documentation, 2001)

For product development, Covisint offered standard tools such as a virtual project workspace or interactive modelling and analysis. In procurement, quote management, auctions and catalogues should electronically support activities like concept development and programme approval. In supply chain management, a standard solution called 'SupplyConnect' aimed to enhance the visibility in the supply chain or to support inventory management.

Covisints portal vision of DC's global supplier portal

As shown in Figure 20, Covisint provided products and services for the integration of the various DC applications such as 'Fastcar' or 'Container Management' already available, while at the same time connecting and integrating all relevant business units on one secure platform.

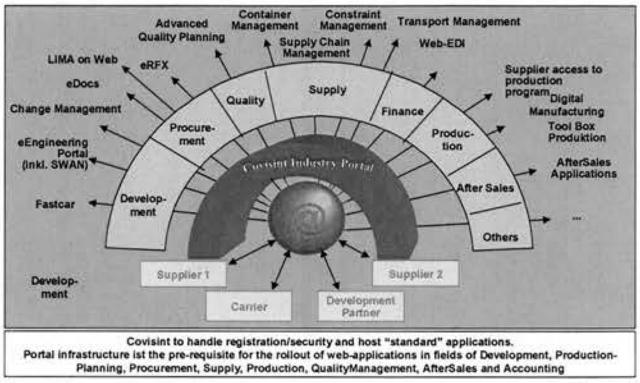

Figure 21. Covisint's portal vision (Covisint documentation, 2001)

Registered supplier users or other business partners should have one single point of access to enter this integrated world of inter-organisational systems.

Apart from its own standardised e-services (e.g., e-auction and e-collaboration tools), Covisint particularly focused on the highest level of integration in order to integrate business processes for the supplier management, for example on standardised portal administration. However, as Figure 21 shows, the portal architecture was designed in an open way to integrate different standardisation levels, from business processes to network infrastructure.

4.5.2 SupplyOn

SupplyOn was the major competitor of Covisint and sees itself as a global player. SupplyOn is a joint venture of global automotive tier-1 suppliers (in the literature also referred to as component supplier). The automotive component-specific expertise of the founders was seen as a competitive advantage for the development of e-marketplace services. As a direct answer to the foundation of Covisint, in April 2000, the tier-1 suppliers Robert Bosch GmbH, Continental

AG, INA Werk Schaeffler oHG, SAP AG and ZF Friedrichshafen AG signed a Letter of Intent (LoI) and kicked-off their e-marketplace business. Offices were installed in Germany and Detroit/Michigan. Covisint has been the trigger for the tier-1 supplier community to counterbalance the OEMs obvious power consolidation. In retrospect, the existence of Covisint was the trigger to set up SupplyOn.

> *"I really felt threatened. At that time, volume bundling has been announced, pricing, where a supplier had to think about how do I develop my strategy. How do I secure a certain independence and a certain degree of options. Step by step this has been one of the reasons why suppliers in the end had decided to set up SupplyOn. We had to look at what are the big differences compared to a OEM and what is supplier-specific. So, this has been one of our start projects to set up SupplyOn"* (A founding tier-1 supplier of SupplyOn).

The basic vision was the same as for Covisint, namely to join forces, bundle know how, and to a certain extent to standardise at the application and the transaction level. However, this eventually changed, as one of the interviewed tier-1 suppliers mentioned:

> *"If you look on how both of them have been developed, it looks like a Y. For a time, it has been parallel, also the question to collaborate (join forces) but then they grew apart and more complementary. Covisint shifted from the original idea of a marketplace to a portal with registration. From there, to the individual portals of the OEMs which has been a desillusion for the participants. Because the hope was only to work with one application and one process and then, it ended up in DC, Ford, GM with separate portals".*

Services of SupplyOn

The product portfolio of SupplyOn targeted suppliers and buyers. According to this business objective, they named their services "Source side" and "Sell side". SupplyOn still provides standardised interfaces and actively supports backend integration. As illustrated in Figure 22, SupplyOn services cover standardised applications for procurement, such as a tool called 'Sourcing Manager' or for supply chain management, through 'Vendor Managed Inventory'.

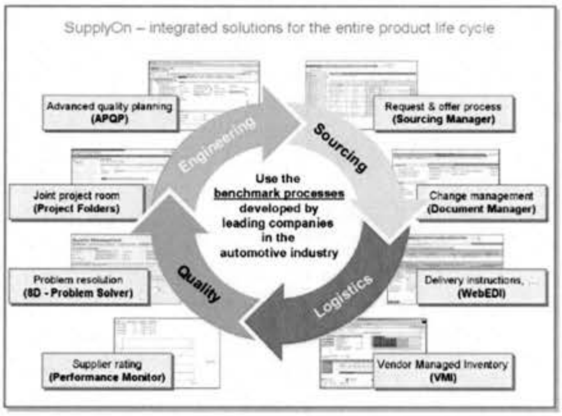

Figure 22. Product portfolio SupplyOn as of 2004 (www.supplyon.com)

Until 2004, SupplyOn recorded 4,600 customers from 30 countries with more than 16,500 active users on its platform. About 1,200 electronic inquiry processes are transacted and 110,000 Web-EDI messages are sent per month. They remained an independent company and the business is up and running, as one of the founding members stated:

> *"Today, the business operates surprisingly positive, no-one had thought this, 4 years before, have achieved break even. Apart from the shareholder's business, SupplyOn has acquired further customers, but unfortunately not many more than expected. They managed to achieve kind of a distance to the original founders, but on the other hand they know that these a loyal customers. The logistic and procurement chain is covered very good, financial services, credit and invoices, we have just started the quality area with supplier assessment".*

At that time, the perception of the industry, particularly of the supplier community, was that the smaller size of SupplyOn was a huge advantage compared to Covisint. The alignment of participating founders and the management of the new company was seen to be much easier than it was with Covisint. One of the tier-1 supplier interviewees stated that even if each of the Covisint founding companies were regarded seperately, the sheer organisational diversity and complexity could be just about handled, but three or four of them could not. The previous subsections have described the history, the challenges of the automotive industry today, as well as the electronic tools and e-markets adopted in the automotive industry. In the next subsection, one of the big players, DaimlerChrysler is presented.

4.6 A brief overview of DaimlerChrysler

According to turnover figures, DaimlerChrysler (DC) is the number four OEM in the automotive industry. In 2004, with its global workforce of 384,723 employees, DaimlerChrysler revenues amounted to € 142.1 billion (Annual report, 2004).

DaimlerChrysler AG was formed in November 1998 as a result of the merger between Daimler-Benz AG, Germany and Chrysler Corporation, US. DC can look back on a tradition of more than 100 years, featuring pioneering achievements in automotive engineering by both of its predecessor companies. In addition, DaimlerChrysler holds a 33% interest in the European Aeronautic Defence and Space Company (EADS), one of the world's leading companies in the field of aerospace and defence technology (Annual report, 2004).

4.6.1 DC brands and the business strategy

Due to the market pressures explained in section 4.3.3., the DC product portfolio ranges from small cars to sports cars and luxury sedans; and from versatile vans to heavy duty trucks and coaches.

- DaimlerChryslers' passenger car brands include Maybach, Mercedes-Benz, Chrysler, Jeep®, Dodge and Smart

- Commercial vehicle brands include Mercedes-Benz, Freightliner, Sterling, Western Star, Setra and Mitsubishi Fuso
- DaimlerChrysler Services offers financial and other services

DC's official publicly communicated corporate **business strategy** has four major pillars:

- a global presence
- a broad and innovative product range
- a strong brand management for the different business units such as Mercedes Benz car group
- technology leadership.

The fact that technology leadership and innovation are intertwined and an important subject within the company is reflected in a strongly formulated commitment to innovation, embodied in a statement of the annual report 2004:

> *"Innovation drives our company and is the key to the worldwide success of DaimlerChrysler. We have a long tradition in this - because DaimlerChrysler and its predecessor companies have stood for pioneering automotive innovation for more than 100 years. With about 4,700 patents each year, DaimlerChrysler secures its leading technological position and thus its lead in international competition. We also intend to set new trends in the future with innovations that our customers can experience in our products every day"* (Annual report, 2004: 5).

As sketched in Figure 23, the Board of Management (BoM) consisted of the CEO, Jürgen E. Schrempp[16], and 10 board members. There is no hierarchical order of the different departments illustrated in Figure 23.

[16] This has changed in the meantime. Mr Zetsche replaced Mr Schrempp, officially from the 1st of January 2006.

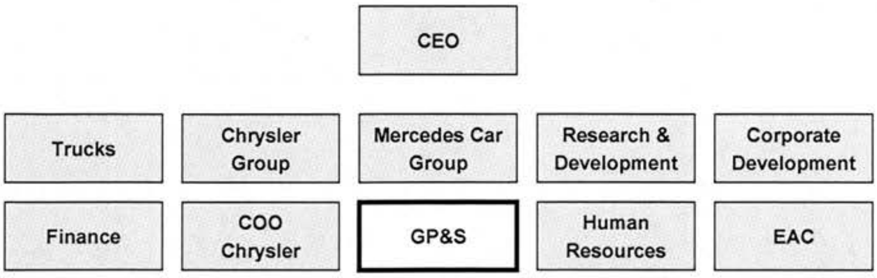

Figure 23. The Board of Management of DC and departments (Annual report, 2004)

As a result of the merger in 1998, the organisational governance structure of DC is very complex. The different departments of the BoM do reflect on the one hand separate brands and on the other hand corporate functions supporting the brands. The function of a "COO Chrysler" seems to be an organisational concession by the former CEO who actively initiated the merger between both companies to gain a sufficient market share and have the size to survive in the automotive market.

The Global Procurement and Supply department (GP&S) is an example of a corporate department (see Figure 23) supporting all brands through procurement and supply services[17].

4.6.2 Global Procurement and Supply (GP&S)

GP&S is not only responsible for the procurement and supply of the corporation on a global basis but is also one of the interfaces for suppliers into DC (research and development is another interface between DC and suppliers). In 2004, DC GP&S purchased goods and services for a total of € 101.4 billion (in 2003: € 99.7 billion). If this purchasing volume were split for individual brands, the Mercedes Car Group accounted for 38% of the total purchasing volume, the Chrysler Group for 32%, and trucks for 26%.

A couple of years ago, GP&S set-up and developed a specific program for suppliers called "Extended Enterprise® "that aims to strengthen strategic supplier relations":

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[17] In the case of IT topics often in collaboration with the different existing IT departments.

"To strengthen the global aspect of our procurement activities and maintain business relations with the world's best suppliers, we have developed the Extended Enterprise® supplier programme further. Within the framework of Extended Enterprise® and with the aid of a scorecard model, we analyse and evaluate the procurement and supply performance of our suppliers from a global perspective." (Annual report, 2004: 78)

In the former Daimler-Benz AG, supply systems and processes were specifically oriented towards the needs of individual plants, due to the decentralised organisational structure. The US Corporation Chrysler, however, was centrally organised within a standardised supply concept for implementation at all plants. In order to integrate both approaches, Daimler and Chrysler jointly described a framework for all supply processes within the corporation. The goal was to define the relationships of upstream and downstream functions, for example development, procurement, production and sales, and to provide at the same time transparency and a comprehensive overview of the complex and diverse interdependencies of supply processes and internal as well as external partners.

In order to visualise the supply system, GP&S created a so-called "Supply House"[18], a vision of successful supply and procurement, including success factors relevant for procurement and supply. This was part of DC's vision to develop an advanced supply strategy to shape the world's most effective supply chain while maximising the flexibility of order processing, delivery and distribution processes at optimal cost efficiency, minimum cycle times and top quality. This vision is guided by six principles which are: (1) customer orientation, (2) value-based management, (3) expertise network, (4) process orientation and process responsibility, (5) standardisation of processes, methods and tools, and (6) a continuous improvement. These principles have to be followed by all employees working in GP&S. This vision in combination with

[18] Due to a non-disclosure agreement with DC, the figure cannot be displayed in the PhD thesis.

the e-business strategy (cf. chapter 5) seemed to offer support in synchronising and rationalising the flow of supply information between DC and its suppliers.

The supplier programme 'Extended Enterprise' – cooperation between DaimlerChrysler and its suppliers – was the driver for the development and use of SCM at the DaimlerChrysler AG. The vision of Extended Enterprise was to create – in close cooperation with the supplying business partners – a Global Supply Network Integration Program that represents a crucial prerequisite for successful market presence. Guidelines for Extended Enterprise were, for example:

- We will shape the future positively by acting jointly
- The needs and requirements of our customers determine our activities and our products
- Efficient companies are our partners
- We require and support creativity and initiative on the part of suppliers
- We expect uppermost engagement with regard to costs, quality, cycle time and technology
- We aspire to have fair and long term partnerships
- We believe in trust, fairness, open communication and information
- We want to be the best customer and the most valued partner of our suppliers
- We act with ecological awareness
- We profess to our social responsibility

Process optimisation and the consideration of the whole supply chain to increase both customer satisfaction and corporate profitability, were the main focus of this programme. Such a programme gained importance due to the increasing need for a global integration of the supplier network into DaimlerChrysler's supply chain.

4.7 Conclusions

As the history of the automotive industry shows, it had been subject to constant changes, and will continue to be so in future. Technology has always been a trigger of these changes. Today's technologies are driven by Internet-based IT of which the actors in the automotive industry try to take advantage. They implement these new technologies in order to respond to external and internal pressure. Due to huge promised benefits, in the past five years inter-organisational systems such as portals aimed to replace the former EDI standards. While EDI always aimed to integrate only the very large suppliers of OEMs, portals were supposed to connect the entire supply base. However, with the adoption of portals, the same issues as with EDI have occurred: unbalanced power distribution within business relationships and a lack of trust hamper the acceptance and use of both IONS systems.

In the automotive industry, two initiatives were founded to further develop the electronic support of buyer – supplier relationships and of collaboration. One of them was Covisint, an OEM-driven e-marketplace. The other one was SupplyOn, which was founded by tier-1 suppliers to counterbalance Covisint. The global supplier portal, one of the e-business projects pushed by DC, should have been implemented by the electronic marketplace Covisint of which DC was one of the founders. The foundation of the e-marketplace Covisint, which attempted to become the common standardised exchange platform for the entire industry, offered DC a number of advantages. First of all, they shared the investment risk with the other co-founders such as Ford or GM who additionally pushed the whole initiative through their market power[19]. Secondly, as Covisint was marketed internally as an investment of DC, pressure was put on the internal departments to follow the e-business strategy directed by DC executives (see next chapter), and to support a possible collaboration with Covisint. Thirdly, in the case of a failure of Covisint, the damage was well calculated and represented not that much of a risk for DC. As a reaction to the foundation of

[19] In practice, it is much easier to act when more than 50% of the players follow the same initiative. In this context, power plays a crucial role.

Covisint, influential tier-1 suppliers such as Bosch or ZF Friedrichshafen founded the e-marketplace SupplyOn because they feared the omnipotence of OEMs' Covisint.

Both e-marketplaces offered more or less the same services. SupplyOn started very moderately step-by-step whereas Covisint spent some of their initial budget for advertising. Unfortunately, most of Covisint's promises only existed on Powerpoint slides. This led to an acceptance level much lower than originally expected. This holds especially for the suppliers.
However, due to the lack of understanding the processes of the automotive industry, as well as management errors, Covisint failed in establishing an industry standard. As a result, in 2004, Covisint lost its independence when software maker Compuware signed a deal to buy the remaining Covisint assets, i.e., messaging, portal and Web services. This followed the sale of Covisint's auction business to Freemarkets[20]. Although SupplyOn still tries to attract more actors of the industry, it has not been a business success either.

In the subsequent chapter, the emergence of DC's supplier portal strategy is described and discussed.

[20] Freemarkets is now part of Ariba.

Chapter 5. The EMERGENCE of a SUPPLIER PORTAL STRATEGY

5.1 Introduction

The empirical data presented in this chapter and the subsequent one on 'development and implementation of a standardised supplier portal' is based on a longitudinal, ethnographic study, undertaken for about two years on the Global Supplier Portal (GSP) project as a participant observer. Although the two chapters are linked, they have been split into two to provide the reader with an easier presentation of the very detailed material.

This chapter addresses, in a chronological narrative, the evolution of the supplier portal strategy of DaimlerChrysler (DC). This strategy was part of the IT strategy which in turn was part of the corporate DC strategy. The term "strategy" is derived from the Greek "*strategos*" and means a general set of manoeuvres carried out to overcome an enemy (Eden & Ackermann, 1998).

Mintzberg (1994) pointed out that people use "strategy" in several different ways, the most common being:

- Strategy as a plan, a "how", a means of getting from here to there
- Strategy as a pattern in actions over time
- Strategy as a position; that is, it reflects decisions to offer particular products or services in particular markets.
- Strategy as a perspective, that is, vision and direction (Mintzberg, 1994).

Mintzberg also argued that strategy emerges over time as intentions collide with, and accommodate, a changing reality. Thus, one might start with a perspective and conclude that it calls for a certain position, which is to be achieved by way of a carefully crafted plan. The eventual outcome and strategy are reflected in a pattern evident in decisions and actions over time. This pattern of decisions and actions defines what Mintzberg called "realised" or emergent strategy (Mintzberg, 1994).

Translated into the DC supplier portal case, "strategy" meant that DC had to adapt to the changing reality in terms of external market pressures to collaborate closer with suppliers, and internal requirements to standardise with Internet-based technologies. From the perspective of Mr Schrempp, the former CEO of DaimlerChrysler:

> *"We at DaimlerChrysler view e-Business as a means of significantly accelerating and supporting both, internal and external processes, while at the same time reducing their duration and cost. But successful e-Business also requires a major readjustment to the approaches taken in many areas along our value chain – from development all the way to sales and marketing."* (J.E. Schrempp, CEO DaimlerChrysler in the preface of the DCXnet annual e-Business report: 3)

Schrempp represented a certain position which he implemented in the set-up of a business unit called DCXnet in order to push e-business in general and the supplier portal strategy in particular. Consequently, the evaluation of a supplier portal strategy and the start of the 'Global Supplier Portal' (GSP) project can be understood as a pattern in decision and subsequent action in order to achieve the objective of a seamlessly integrated value chain.

This is underpinned by a statement in the annual e-Business report of 2001:

> *"Completely new prospects for networking with suppliers have opened up as result of the Web. Collaboration is significantly simplified by this globally uniform medium. As a consequence of the increasing interconnectedness of the suppliers themselves, the demand for a universally 'networked' industry is being met to an ever greater extent".* (Annual e-Business report of DCXnet, 2001)

As Schrempp pointed out, the successful adoption of B2B e-commerce needed major re-definitions of approaches used in the past. The global supplier portal was one of the projects where a new approach combined with new technology could open up a variety of possibilities to integrate the entire supply chain by bridging inter-organisational processes. Consequently, this would ensure a more profitable collaboration between DC and suppliers. The message given by Schrempp was to actively exploit all big chances which Internet-based technologies were supposed to offer.

The remainder of the chapter will proceed as follows. First, the early e-business activities at DC, and how DC got involved in the Internet "hype", will be reviewed. The first initiatives and their failure are described and analysed in greater detail, from the initial idea of a cross-departmental organisation through to its implementation. This will be followed by description of the next level of approaching e-business in a more efficient way through the foundation of a new organisational unit, DCXnet, and of Covisint. Subsequently, the options of the portal strategy are outlined and discussed from different perspectives. The chapter is concluded by a presentation of the two other founding partners of DC, Ford and GM, and their e-business activities as well as a discussion of the strategic option two competitors, BMW and VW, had chosen.

5.2 E-business – Status quo

The chronological course of events at DC regarding the portal strategy is illustrated in Figure 24.

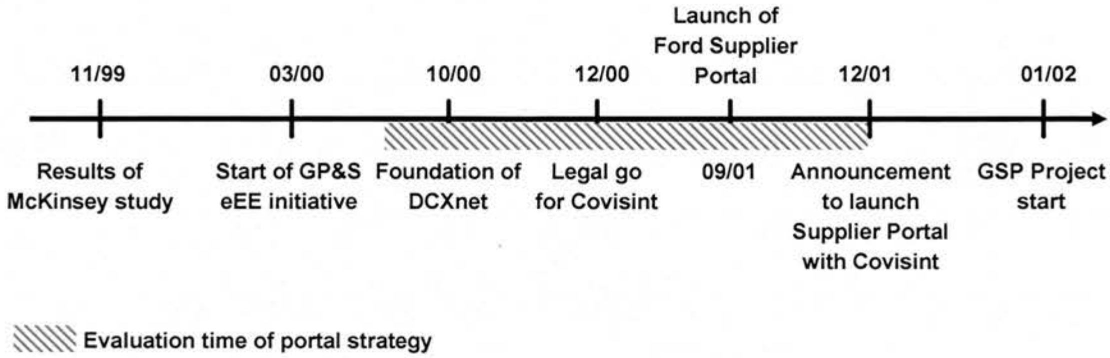

Figure 24. Chronological course of events (Own figure)

For DC, the Internet endeavour started with a ranking of their Internet web presences by McKinsey in 1999. It was considered to be very poor. Most popular car sites then were Microsoft's CarPoint and Cartalk, followed by traditional competitors such as Toyota; Chrysler ranked 8th, BMW 19th, Dodge 22nd, Mercedes Benz only 35th.

The ranking and the different other factors were the initial start to think of and review web interfaces from DC to customers and to suppliers; this was done during a period of two years. As figure 24 illustrates, the evaluation of a supplier portal strategy started mid 2000 following the successful launch of applications linking DC with its suppliers described in the next sub-section. The overall situation of DC in 1999 could be characterised as follows: no existing e-business strategy, no common e-business platform for supplier communication, individual e-business initiatives across DC, and strongly EDI-based communication. Additionally, increased pressure from e.g. strategic suppliers forced DC to deal with e-business more seriously in order to tap into its potentials and to optimise business processes (Truhart, 2001).

GM and Ford had already started to implement e-business initiatives, and suppliers had also begun to demand a more efficient information exchange preferably in "real-time".

5.3 Networks at DC – first activities

As always in the past 20 years, the automotive industry was characterised by a high pressure[21] to collaborate more closely with business partners, primarily with tier-1 suppliers but also with all other supply partners. However, this required an inter-organisational strategy that covered more than the already well adopted use of EDI (see section 4.3.3). Such an IONS strategy had to take into consideration not only the already existing business relations with suppliers and the EDI technology in use, but had also to manage the integration of any Internet-based solutions into the existing IT infrastructure.

At the end of the 1990s, all large OEMs had launched a number of applications covering their entire value chain, including e.g., electronic collaboration and electronic catalogue projects. Those stand-alone applications were operated successfully within functional departments but were not integrated with each other. As described in section 4.3.3, the pressure for collaboration led organisations in the automotive sector to become involved in a range of IONS projects in order to become networked with the whole industry.
Table 5 shows e-collaboration examples at DC in 2000. This included electronic collaboration projects, the integration of engineering processes, and electronic catalogue projects to present product and service data.

[21] These pressures were described in 4.3.3.

Table 5. Examples of single e-collaboration projects at DC (e-Business report, 2001)

Business unit	IONS application example	Characteristics
Engineering	▪ FastCar	Integrated Internet-based development platform for engineering
Procurement	▪ Open Bidding (OBE) ▪ EDocs ▪ Catalogue buying	▪ Auction tool ▪ Standardised documents ▪ Suppliers provide goods and services in electronic catalogues
Logistics	▪ E-supply	Internet-based supply chain management tool

Other OEMs basically faced the same situation. GM, Ford, BMW and VW also tried to improve their various engineering, procurement and logistic processes. As Figure 24 illustrates, Ford had already launched its new supplier portal (with Covisint) in September 2001. Electronic auctions were the first Internet-based tools implemented in all the above organisations. However, e-auctions cover only a small part of the entire value chain process. According to Kumar and van Dissel (1996), such IONS were adopted not only to achieve operational effectiveness by reducing co-ordination costs and transaction risks but also to improve communication and information presentation (Kumar & Dissel, 1996). Within DC, the motivation to find the right e-business and supplier portal strategy was triggered by both, external and internal pressure (internal presentation).

Continuous cost pressure and cost-benefit considerations, paired with an innovation marathon in electronic devices for cars had forced DC to completely rethink their supply chain strategy. Changes in procurement and logistics (e.g., increasing popularity of global sourcing and logistic concepts such as JiS) led to severe quality issues, particularly in the passenger car sector. Therefore, a global portal connecting all suppliers in order to address those issues would have helped to build up a large automotive network. It was also seen as a means to improve customer satisfaction and increase revenue growth and shareholder value (an important aspect to consider as a public company listed at all major stock exchanges).

The internal pressure to standardise and streamline inter-organisational activities was the second important initial trigger. A coherent strategy should not only reduce costs but also increase efficiency of information and data exchange, and take advantage of leading-edge technology (as technology leadership was one of the postulated corporate strategies).
An e-business strategy as part of both the corporate and the IT strategy aimed to reduce cost and risk of IT by harmonising the IT architecture. This would then allow the implementation of e-Business applications designed according to well-defined standards. The standardisation of the overall IT infrastructure was seen as a major step to globally support and to push all e-Business activities within DC (Annual e-Business report, 2001).

One of the outcomes of the McKinsey study was that the Global Procurement and Supply department (GP&S), which was responsible for supplier relationships, started the 'Electronic Extended Enterprise' (eEE) initiative in the first quarter of 2000. At this point in time the Internet had created a special atmosphere in the so-called brick-and-mortar[22] organisations. Those mostly large and traditional companies felt the urge to participate in this exiting new world of technological innovation in one way or other, and they wanted their share of influence.

5.3.1 GP&S and the eEE programme

The Top Management (TM) felt annoyed by the McKinsey results. After all, they represented a solid traditional company. Consequently, they charged the Corporate Procurement Officer (CPO), Gary Valade, to come up with a concept to address the issue.

[22] Brick and mortar refers to companies that have a physical presence and offer face-to-face consumer experiences, as opposed to an Internet-only presence (see online shop for comparison). Brick-and-mortar companies usually are companies that have been in their specific field or service since before the dot-com boom of the 1990s (http://en.wikipedia.org/wiki/Brick_and_mortar as of 24th of January, 2006).

GP&S was the department in charge supplier relationships. Thus, it seemed logical to assign them to push e-Business and a related strategy within DC. In 2000, the functional organisation and the eEE programme started. The eEE programme intended to significantly change existing supply processes and thus increase the efficiency of the whole supply chain by exploiting Internet technologies.

Based on the already existing concept of the 'Extended Enterprise®' (EE) (see chapter 4.6.2), which attempted to optimise processes throughout the entire supply chain together with supplier partners, GP&S only put the "e" (for 'electronic') before the name of the existing supplier programme (Internal documentation, 2002).

Although an e-strategy was defined by the eEE organisation which focused on four pilot projects, it turned out very soon that eEE would fail due to a lack of acceptance within DC, and because of its biased dual position as a programme as well as a functional department which was part of GP&S (eEE presentation, 2001).

In addition, communication issues and lack of leadership emerged at different DC sites, triggered by the post-merger situation. The complex organisational structure of DC with its heterogeneous processes also contributed. In particular, the production plants objected, largely to keep their independence.

In the automotive industry, the production plants enjoy a high degree of freedom as they are manufacturing the cars. Historically, they represent independent organisational units which mistrust every activity originating from a corporate department. In addition, there was no clearly developed strategy for the distribution of quantitative benefits to be shared between eEE and the production plants.

An additional reason for the eEE failure was the lack of commitment by top management and a non-existing budget to implement e-Business in the organisation. There was a constant lack of human resources with appropriate skills for eEE as business units feared to loose their qualified people if they seconded them to GP&S. Finally, eEE had to cope with the complex IT infrastructure and various legacy systems installed all over the organisation, which were difficult to understand without adequate IT knowledge.

Another important point was the communication between GP&S and IT – or rather the lack thereof – related to a common supplier strategy. GP&S had too little technical IT knowledge to speak to DC IT at eye level, and therefore tried to hide as much as possible of their supplier strategies, even if they were IT-related. Another unsettling fact was the strong move of the IT department to take the lead in e-business (personal impressions and conversations with GP&S and IT managers).

5.3.2 IT & existing supplier portals

One of the corporate strategic goals was the leadership in corporate IT. The corporate IT strategy proclaimed the concept of a proactive IT architecture for all applications and systems. It was to be based on a modern, scalable and consistent IT infrastructure with standardised products (Annual Report, 2001).

The belief of the upper management was that such an IT infrastructure was one of the cornerstones of a successful e-collaboration strategy. Approved by the Board of Management, the IT department was developing such a 'proactive' IT infrastructure. All relevant IT infrastructure elements were centrally controlled, and their use was mandatory for all e-collaboration projects. However, existing current operational IT systems for procurement and supply only supported local tasks, and global data were only available on an aggregated level. To integrate processes and to capture synergies on a global basis, new IT functionality was required. Different single initiatives in the procurement units were not interlinked, and there was no overall coordination of local and divisional initiatives (Annual e-Business report, 2001).

Furthermore, the implementation of a standards-based infrastructure was seen to provide many benefits to DC:

- Timely provisioning of IT infrastructure test and development environments
- Economies of scale through global contracts (hardware and software)
- Global access to all key infrastructure components
- Improvement of ROI through infrastructure reuse across multiple projects
- Replication of common solutions in all DC locations world wide
- Reduction of lead times for new applications (development and rollout).

A first step to implement the corporate IT strategy was expressed in a so-called "Developer Resource Portal" (DRP), a standardised developing environment including tools, techniques, etc., to assist the internal customers in developing applications according to standards, etc. (Annual e-Business report, 2001).

Within DC, the supplier portal issue was addressed differently by the Chrysler side in Auburn Hills (DCA) and the Daimler side in Stuttgart (DCS). In 1998, the portal software market was in its infancy and consisted only of a handful of large players. The DCS IT department decided to develop its first portals in-house. In Germany, the 'DCS Supplier Portal' did not only offer a single point of entry as a secured link between DCS and its suppliers, but also reduced process times. Furthermore, DCS attempted to provide support within the Supplier Portal based on the idea of "one-face-to-the-customer". A central user help desk offered technical support concerning the portal and the associated applications.

The functionality of the first release offered a guest login and a secured user authentication, a portal specific directory, a single sign-on and a unique user account. The portal incorporated three e-business applications. The test phase combined with a controlled roll-out started in January 2001. Another release followed quickly and replaced the first one, with functionalities such as dynamic personalisation, decentralised administration, national language support, encrypted communication, task box, registration service and global user directory (corporate directory).

In contrast, Chrysler was connected to its suppliers via a portal called 'Sponsored Partner Information Network' (SPIN) since 1994. This web-based infrastructure hosted more than 100 applications connecting over 5,000 trading partners. Consequently, two supplier portals existed in parallel in the US and Europe[23]. As a result, from an IT perspective, a portal was seen as consolidating applications in order to realise savings and check for the best technological solutions available.

5.4 A focused strategy approach

In parallel to the unsuccessful attempts of GP&S and IT, the TM analysed the influencing factors and consequences of e-Business on DC's business activities. As a result the TM decided to found an organisation which would translate and push this transformation process throughout the entire corporation (Annual e-Business report, 2001).

5.4.1 The foundation of DCXnet

The foundation of the DCXnet holding, at the end of 2000, was a logical step in the corporate strategy and was presented as an effort to consolidate all company-wide e-business investments and activities in the areas of B2B, B2C, and telematics[24], and was understood as a means to translate the strategic concepts into practice.

In the annual report of DCXnet, Jürgen E. Schrempp the CEO of DC admitted that:

> *"...e-Business is already an integral part of daily operations...results of pilot projects are being transferred to all levels and throughout the entire DC corporation, DCXnet will be a major step*

[23] Other regions of DC also started portal initiatives, for example South Africa.
[24] http://intra.daimlerchrysler.com, DaimlerChrysler consolidates e-Business Activities and Founds New DCXnet Holding, 05.03.01.

forward toward our goal of making DaimlerChrysler the first automaker in the world with a completely networked value chain".

Consequently, DC established not only a functional department but also the strategic programme called 'DCXnet'. A DC business manager described the situtation very clearly:

> *"In 2000, DC launched an e-business initiative called 'DCXnet' as a result of the outcomes of a study of the impact of e-Business/Internet on DC's business activities (in cooperation with business units and corporate departments) within the framework of "e-Strategic Business Development".*

The objectives and roles of DCXnet were manifold, as sketched below:

- Budget responsibility for initial investments; for example, for Covisint or the GSP project
- Role as coordinator/facilitator between GP&S and IT
- Support of GP&S due to their lack of acceptance
- Support Covisint in terms of their set-up of business and develop together with Covisint standardised industry solutions (Annual e-business report, 2001).

DCXnet could not only be seen as budget source, but also as coordinator. From past experiences, it seemed necessary to ensure the implementation of a corporate e-business strategy by a third party in order to balance the interests on a cross-departmental level. Figure 25 shows the DCXnet organisation.

Figure 25. The DCXnet organisation (Annual e-businessl report, 2001)

The programme was launched to coordinate future strategies in the area of B2B, B2C, and telematics on a higher level. It aimed to coordinate an overall eBusiness strategy throughout the corporation to link internal and external processes and people, and consisted of four modules: (1) ***Business Connect*** which aimed to improve the collaboration with suppliers, (2) ***Workforce Connect*** which wanted to build a stronger network of employees, (3) ***Customer connect*** which wanted to strenghten the link to the dealer base, and (4) ***Vehicle Connect*** that dealt with the telematics in a car. Consequently, the global supplier portal was part of the ***Business Connect*** strategy which was worked out in cooperation with the procurement department (GP&S) as one of the interviewees pointed out:

> *"The supplier portal was part of the global procurement as well as of the global IT solution strategy which took into consideration the corporate IT strategy"* (DCXnet manager).

In order to achieve this global transparency, one single point of entry through a supplier portal was part of the overall Covisint strategy. DCXnet opted for the 'early adopter approach' to take advantage of promised potentials related with the use of web-based technologies in order to gain competitive advantage. Consequently, the next step was the foundation of Covisint. This approach was driven by DCXnet and also aimed at joining forces with Ford and GM in order to set a de-facto industry standard (Annual e-Business report, 2001).

5.4.2 The foundation of Covisint

As the objective to achieve standardisation across the entire supply chain was a top priority of DC's agenda, DC attempted to push its own organisation for standardised solutions. With the foundation of Covisint, DC, Ford and GM not only created a new consortium; the additional objective of Covisint was to set up a de-facto standard for an e-commerce platform in the automotive industry.

In 1999[25], to leave 'all avenues open' (i.e., either acting alone or being part of a greater interest group), the electronic marketplace Covisint was founded in Detroit, close to GM and Ford. All three companies became shareholders of the new company. This close vicinity later influenced the entire development process of Covisint and the Global Supplier Project (GSP) (see chapter 6). The total investment in Covisint by DC, Ford and GM amounted to around 500 million dollars.

For DC, being a shareholder of Covisint was a strategic benefit for several reasons: First, the financial commitment could yield a high return on investment. Second, forming an alliance with two major competitors and leading the way was a demonstration of power for the entire automotive industry. In line with the corporate strategy of being a technology leader, DC wanted to demonstrate that it had understood the innovation signals radiated by the Internet. DC found itself in the same situation as other OEMs in terms of the need to improve supplier relations and cut down cost. Electronically supported collaboration across the supply chain was on every company's agenda. Therefore, the foundation of Covisint was a natural step to increase efficiency in the industry through a collaborative effort that distributed risks and costs across the players and ensured standardisation of business processes and information exchange.

[25] The date differs from the date in the figure 21 because in 1999, the first meetings concerning Covisint started. In Spring 2000, the unofficial launch of Covisint took place which was legally allowed end of 2000 (see annual figure in figure 21).

Using leading-edge Internet technology Covisint should help DC to reorganise internal and external business processes. Consequently, Covisint was a means to an end, supposed to enforce process harmonisation through the introduction of best practice processes and standardisation of the ICT infrastructure across the corporation.

5.5 The search for the philosophers' stone

GP&S and their eEE programme failed, and GP&S managers were not able to join forces with IT in order to develop a supplier portal strategy at a cross-departmental level. Due to the unsuccessful attempts of the eEE programme to establish acceptance and professional experience in e-business projects pressure on GP&S was increasing. Gary Valade, the Head of GP&S, was forced to react. The creation of one single global supplier portal held many potential benefits for both DaimlerChrysler and their suppliers, including:

- Major improvements in OEM-to-supplier and supplier-to-supplier communication worldwide, supporting data exchange and synchronisation across the entire supply chain
- A uniform solution for web-based applications, providing users with a simple, common interface for navigating and conducting business across DC's systems and those of its partners
- A simplified user experience, driven by a single sign-on identity, and backed by a high-integrity, cost-efficient security system
- Increased efficiency, enabling the company and its suppliers to focus on their core competencies (i.e., making high quality cars and trucks), rather than on reinventing the business (internal presentation).

The automotive industry was very well aware of the fact that an improvement of the inter-organisational collaboration was necessary. The remaining question was how this objective could be best achieved.

5.5.1 The alternative options: in-house or outsourcing

Usage of the platforms mentioned above required complex use of technology and incorporated a multitude of standards. Consequently, the decision to integrate business partners with IONS involved a range of actors and perspectives and required a strategic decision related to inter-organisational collaboration: whether to implement commercial off-the-shelf systems (COTS) or to implement standardised technology; i.e., 'do-it-yourself' (make) or 'outsource' (buy). This was a strategic decision as it meant either to develop a bespoke solution or to join forces with other OEMs to develop and implement a standardised solution.

The decision depends on the individual situation of a company, including, for example, the company's individual strategy or its current position in the market. Both alternatives were implemented in practice in various firms with different outcomes for the implementing organisation as well as for business partners (particularly suppliers). Table 6 exhibits the criteria of the different alternatives.

Table 6. Criteria of the different alternatives

Alternatives / **Criteria**	**(1) Customised OTS solution make DIY**	**(2) Industry-standard solution Buy Outsource**
Economies-of-scale	No	Yes
Differentiation to competitors	Yes	No
Process-owner Processes	Yes OEM-/Tier-specific	No Industry-standard/Best Practice

According to an official presentation of a DC GP&S manager, three criteria largely guided the discussion of the pros and cons of the strategy to be decided upon: the economies-of-scale, the differentiation to competitors and the process-ownership.

Economies of scale criteria

Advantages and disadvantages of both alternatives from a cost-benefit point of view were leading to the overshadowing question if the implementation of an "in-house" solution would be cheaper than the implementation of an industry standard.

Among the OEMs, not only at DC, this was discussed under the 'economies-of-scale'[26] heading. Business management defines economies of scale as to occur in industries with high capital costs in which those costs can be distributed across a large number of units of production (both in absolute terms, and, especially, relative to the size of the market). Translated to the implementation of a customised solution it meant that no economies of scale could be realised because the number of users (only the company itself) is restricted and the average total cost would not decrease. Also, experience indicated that the 'make' option would require customisation related to specific company processes which usually tends to generate high extra cost, e.g., for additional programming.

In addition to these cost considerations, it was not DC's core business to set up a global supplier portal. This is where outsourcing and Covisint, offering industry standard solutions, enter the game. Industry-standard solutions were characterised by no differentiation from competitors and uniform processes that can potentially offer economies of scale. With Covisint, DC would not only reduce cost and risk (and therefore realise economies of scale), it would also increase its power in the market and thus determine standards and publicly demonstrate a certain power vis-à-vis competitors that were not participating. In addition, the consolidation of the different existing portals would contribute to lower operational and maintenance cost.

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[26] Often, economies of scale are mixed up with network externalities.

Differentiation to competitors

Around the turn of the millennium, the launch of an electronic marketplace or a business portal, or at least whether or not to join forces with other organisations of the same industry were hot topics for discussions in many industries. Apart from cost-benefit considerations of implementing a supplier portal the question about the differentiation to competitors was hotly discussed. In marketing, product differentiation is the modification of a product to make it more attractive to the target market. This involves differentiating it from competitors' products. The question was whether or not established brands would suffer from a global supplier portal which was co-financed by two other major competitors. The already existing supplier portals supported selling the DC brands, Mercedes and Chrysler. They thus represented marketing for DC and differentiated it from competitors. On the other hand, a supplier portal operated by Covisint meant that DC would at least reduce this benefit, and IT managers expressed their concerns to lose the uniqueness of the brands. Some DC managers feared that customers and potential customers would get a negative image of DC due to an alliance with car brands that were clearly outside the 'premium' segment. Independent from that, however, the dilemma how to balance the options of differentiation versus standardisation still remained.

Process-ownership and processes

In terms of processes and process-ownership, in-house meant independence from any other business partner. However, processes would remain company-specific, hence offering no economies of scale. At DC, independence was assigned a very high value. There was the pride of being one of the premium OEMs, associated with the fear of the loss of control over processes and IT responsibility. In addition, concerns about security and technical integration difficulties were expressed by opponents of Covisint. As these opponents were based in the IT department it might be suspected that these arguments were little more than a red herring; the real fear was of loss of control of technical resources and processes.

Industry standard solutions such as the e-marketplace of Covisint offered a standardised IT infrastructure reflecting business processes common in the automotive industry, also called "Best Practice". With the outsource option, the involved companies would lose their full independence and would have to come to grips with industry standards that resulted from best practices of the industry, but that would not necessarily fully cover the own processes.
However, the outsourcing option was in line with the TM's views. Their perspective on IT, including portal technology, was directed by the vision of a standardised corporate infrastructure and characterised by the business objective to save money on IT infrastructure while harmonising systems and applications. The discussion about 'in-house' or 'outsource' business processes in procurement and logistics separated the participating departments of DC. DCXnet's and GP&S' understood the portal technology as an underlying infrastructure to enable inter-organisational processes (between DC and the suppliers). Consequently, it was of no relevance if this portal infrastructure was provided and hosted by DC or elsewhere. However, IT had a totally different understanding of the subject. The supplier portal was seen as an integral part of the corporate IT infrastructure and therefore belonging to DC rather than to a third party such as Covisint. For the IT department, Covisints' integration within DC had already been a concession; a further project like the global supplier portal would mean another defeat for them (Own participant perspective).

Eventually, four major factors shaped the portal strategy: Internet technologies, budget, organisational history, and company culture. Although technology providers promised cheap and easy-to-implement solutions, challenges were seen in the technical and organisational integration of a supplier portal into the existing IT architecture, and in the incorporation of existing applications and their corresponding functionalities. In the technical integration context, IT security was very high on the agenda of DC IT's top managers, at least of those in Stuttgart. The supplier portal hosted in Stuttgart was secured by different firewalls and role-based authentication systems. Additionally, apart from contact details such as address, phone, etc., supplier company administrators wishing to log-in had to fax a copy of their personal ID in order to prove that they were who they claimed to be. This clearly shows the level of concerns and doubts of the DC Germany-based IT department regarding collaboration with external parties.

Working with the former supplier portal hosted in Stuttgart, suppliers were forced to change their password every 4 weeks which caused an unsatisfactory situation within supplier organisations and led to workarounds (e.g., the password of the month was printed and posted centrally for everyone to read it). The US-based supplier portal, though, could be reached one login and a permanent password. Suppliers were never forced by DC US to change the password and automatically had access to every application linked with the portal.

Second, budget considerations influenced the portal strategy. A defined budget influenced procurement negotiations with suppliers and influenced the way DC attempted to operate and maintain a scalable and consistent IT infrastructure. As DC and the other OEMs experienced shrinking margins and were continuously forced to lower their production cost, the idea with respect to Covisint was to join forces in order to achieve better prices, using e.g., electronic bidding tools (e-auctions). At a next level of supplier integration, a supplier portal should also, for instance, help integrate supply chain planning systems of suppliers into the DC IT architecture in order to increase the performance of material forecasts. Finally, organisational factors such as the past history and the company culture, for example trust and power, shaped the portal strategy. This will be addressed in the following section.

5.5.2 The battle of interests

Although a multidisciplinary approach had been chosen, the B2B council[27] introduced a clear distribution of roles between the different actors in the portal case. Three departments were involved in devising the portal strategy for DC, each group representing its own interest during the decision phase of the portal strategy. Their roles and interests are described in Figure 26 and explained in-depth in the remainder of this section.

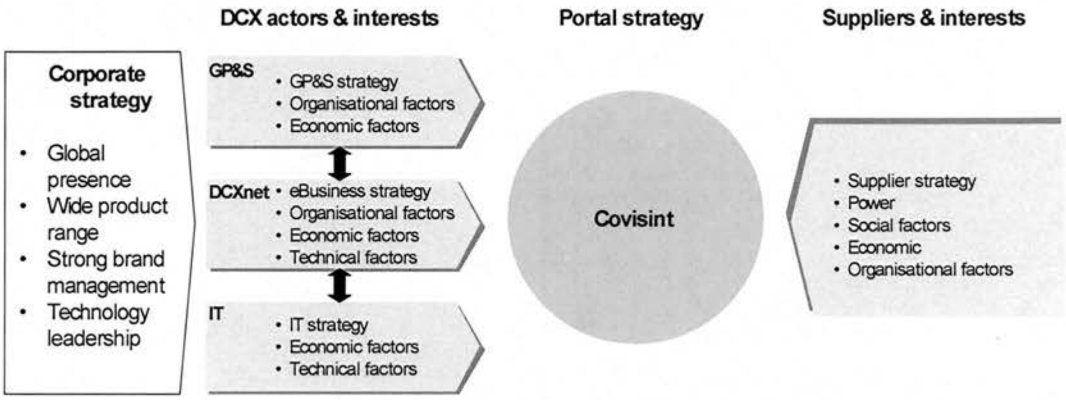

Figure 26. Actors and factors shaping the DC portal strategy

GP&S

As already mentioned, the Global Procurement & Supply department (GP&S) was in charge of the management of relations with suppliers, including the supplier policy. The procurement departments play a key role in most sectors because they contribute significantly to the value of a company. Every Euro of savings has a direct impact on the EBIT[28] of an organisation which is an important figure for financial institutions and shareholders. Therefore, GP&S understood its role within DC as very important although company-wide the level of acceptance of its service offer and activities varied from limited to no acceptance at all. The vision of GP&S was formulated in a statement aiming for the "Shaping of the World's Most Effective Supply Network". GP&S aimed to

[27] The B2B council was a sub-group of the TM. In regular meetings, they were supposed to be informed about the on-going activities and decisions to be made by the respective groups working in the B2B area.
[28] EBIT: earnings before interest and taxes; a business ratio particularly important for companies quoted at the stock exchange.

optimise and balance what they called 'value drivers' such as system cost, technology, supply and quality (eEE brochure, 2001).

Based on internal customer requirements, the GP&S department is responsible to achieve quality goals, optimise costs, identify and acquire technology and innovation and provide fast, reliable and consistent delivery of goods and services (Global Supplier, 2000). With the experience already gained from the eEE venture, and pursuing own strategic goals, GP&S was to some extent involved in the shaping of the portal strategy. In an interview, a GP&S manager tries to link the GP&S strategy with concrete activities:

> *"As GP&S is responsible for supplier partner management, the portal will help us to work with the best suppliers, for example in implementing a global commodity strategy in order to save money. Therefore, the portal is part of the implementation of the strategic goals of eEE supplier programme".*

There were two issues associated with the GP&S strategy. First, all applications in place were only supported by individual inter-organisational processes. Second, one of the objectives was to achieve consolidation of applications in order to keep system costs to a minimum and to keep pace with current technology developments.

However, the goals of the existing supplier policy, i.e., to collaborate with suppliers in a partner-oriented way, were missing from the GP&S mission/vision. Suppliers suffered from the need to communicate with various different departments and different people at DC. Consequently, the effort to manage supplier relationships effectively had increased in a way neither desired nor intended. There was a current need for only one 'single point of entry' into the DC world:

The way we do want to collaborate with our suppliers is written down in the eEE principles. Our business relationships are based on partnership. With all the different applications, we, unfortunately, cannot provide the suppliers with one single communication channel which hopefully will change with the supplier portal '" (GP&S manager).

DCXnet

The newly established DCXnet department had a number of objectives to achieve that were put on the agenda by the TM. Most notably, it had to actively develop the e-business strategy. In addition, the founding of DCXnet allowed the TM to better control the course of events and the progress of activities in the area of e-Business, as well as the decisions to be taken. Moreover, they could get direct feedback from DCXnet which was in close contact with all business units and departments. External and internal public relations, such as for example the distribution of e-business success stories and the progress of e-business activities across the corporation, were tools DCXnet consciously used to achieve positive awareness of e-business in general.

Analysing once more both existing supplier portals, the 'Business Connect' team of DCXnet identified risks such as complexity, double efforts, redundancy and inconsistency of information. The team was also supposed to actively support the GP&S department in focusing on all types of e-business activities in order to get a better company-wide acceptance and reputation. Another objective was to wisely spend the budget which was allocated generously by the TM. This money included not only the initial investment in Covisint but was also related to e-business projects such as the GSP.

Finally, the Business Connect team of DCXnet was not only the link between DC and Covisint but also played a very active role in influencing and coordinating Covisint's actions (obviously, DCXnet had an interest to look very closely at what Covisint was doing or was not doing as they were financially involved with a considerable amount of money). For example, they would support Covisint in setting-up their own business (e.g., establish contacts with important DC managers and to ask them about their advice, to make them feel included) as well as to help them in developing the promoted 'standardised industry solutions'. One could safely assume that DCXnet was very well aware of the fact that not much of the promoted standardised portal existed. However, they actively sold Covisint as success within DC (Own observation and personal experience).

After the definition of the corporate e-business strategy and the first steps to integrate them into everyday business, DCXnet was to be re-integrated into the corresponding business units to ensure the local adoption of the strategies. However, the date of re-integration had never been defined. When it was announced before the portal pilot, this came surprisingly early for everyone in the GSP project team. No reasons for this timing were given,

IT

During the time of the eEE programme, GP&S and IT already had to work together. This was not really appreciated by GP&S because of their understanding of their role. However, GP&S suffered from a certain lack of IT knowledge. On the other hand, it was the primary objective of the IT department to deliver IT services. The departments were, therefore, forced to work together in the e-collaboration pilot projects. Despite some quarrels while pursuing their respective own agenda, GP&S and IT formed an alliance when it became clear that DC would go for the Covisint option which was pushed by DCXnet and represented the objectives of the TM. The implementation of DCXnet, which was equipped with political power and the necessary budget, was seen with some distrust by GP&S, IT and the production plants. This emerged on several occasions during the GSP project, particularly when difficulties occurred (this will be discussed and analysed in chapters 6 and 7).

Based on their experiences with different supplier and engineering portals, IT was pushing the topic 'supplier portal' in a way that made them look more favourably. The IT department was not only operating and maintaining the portals but was also responsible for the development of applications based to the needs of the GP&S department. Therefore, they were very aware of the consequences of having one portal in place instead of many different ones. In addition, one meant a consolidation of applications and a re-check of the existing applications whether or not they fulfilled the technical portal integration requirements.

In addition, IT had set-up an initiative that focused on the analysis of the existing portal world and came up with a business case for a single supplier portal. In a study, they identified inefficiencies and risks of communicating with suppliers through different interfaces. Those inefficiencies of inconsistent and redundant presentation of functional departments caused high cost of connection, heterogeneous IT-technology, multiple implementations of identical functionalities, as well as high risks through lack of security and inefficient processes, as for example multiple logins for internal and external users (Internal documentation).

IT calculated the business case in favour of a DC in-house solution and pretended this to be "for security reasons"; they were strictly against a solution operated by a third party. Additionally, the proposals for migration of the different portals and the integration into the corporate IT architecture seemed to be cumbersome, expensive and to slow to deploy. Obviously, the suggestions for a supplier portal strategy seemed too heavily influenced by an IT perspective and the TM feared that GP&S needs would not be sufficiently considered. The IT department was a very dominant organisation with very strong leaders. They were very good in what they were doing in their area, as they had a lot of professional experience as well as IT management expertise (participant observation).

Component suppliers

Suppliers, particularly tier-1 suppliers, were aware of ongoing developments with respect to a re-direction of supplier activities at DC. However, apart from random information, suppliers were not involved in the portal strategy and eventually had to accept Covisint.

Most tier-1 suppliers also worked on their own e-business strategies with respect to collaboration with their tier-2/tier-3 supply base. Additionally, based on practical considerations and realistic cost calculations, suppliers planned to develop their own portals. The procurement manager of a tier-1 supplier explained the companies approach:

> *"We worked on a strategy keeping in mind what makes sense, what can we offer through the interface portal and portal design, not necessarily with the title "we need a portal by all means" because it was the trend."*

However, the development and implementation of most of the tier-1 supplier portals for the tier-2 and tier-3 suppliers followed only after a time of observing the early adopters in the portal arena.

IBM

Once the announcement to use Covisint had being made DCXnet started to talk to, and to integrate, IBM, DC's strategic technology partner, in the further planning of the portal project. Prior to that, IBM had only been allowed to contribute to some special technical questions, for example the future data base design for user management data. IBM was also given the opportunity to present some alternatives for content management solutions and to evaluate them. As the strategic technology partner, they were neither integrated into the e-strategy development process nor the supplier portal strategy. One reason for this was that DC was too proud to enlist external support to find an adequate DC e-business strategy (virtually every consultancy company existing at this time had offered their services to DC). Also, IBM already worked very closely with the IT department. Consequently, DCXnet feared they could leak to DC IT confidential information they got at DCXnet. In this situation, DCXnet used their power to exclude IBM from participation in the definition of the portal strategy. However, IBM was allowed to support DC in the development and implementation phase where DCXnet experienced a lack of technical experience and did not trust some of the arguments brought up by DC IT. During the development and implementation of the portal, IBM experienced the same issues between DCXnet and IT (Own participant observation).

5.5.3 The decision and its announcement

The final decision was shaped by the three major actors GP&S, IT and DCXnet. In a way, this cross-departmental approach reflected the DC company culture which had two main characteristics: some decisions were made on a corporate level, for example decisions that were concerning several business units, whereas others were made within single business units for special business reasons. One of the interviewees involved from the beginning made a point about the internal policy:

> *"The top management deliberately wanted this cross-departmental approach to get everybody involved and to get everyone's opinion at one table. Also, in anticipation that a business unit could not complain later and object that they were not asked"* (DC manager).

With regard to the IONS/portal strategy, Gary Valade proudly stated:

> *"We are reinforcing our commitment to creating industry standards in the Internet space by choosing Covisint for our portal development. We anticipate that our supply partners and ultimately our customers will benefit from the elimination of time-consuming, cumbersome and expensive web applications that do not interface with each other"* (Internal documentation, 2002).

The official press announcement in automotive journals and the daily press read like this:

> *"In a continuing effort to implement its comprehensive e-business strategy, DaimlerChrysler AG (DC) today announced its selection of Covisint to develop and host the company's new, global supplier portal. This will be the next generation of the company's supplier portal solutions. The portal will integrate all OEM and supplier applications as well as Covisint-tools worldwide via one common framework, based upon input from DaimlerChrysler and its suppliers in the Extended Enterprise®"* (Internal documentation, 2002).

Eventually, after more than six months of evaluating both options, either to set-up the global portal (make) or to buy and let at an external entity host the portal (in this particular case Covisint; (outsource)), the official announcement of the decision by Gary Valade (externally and internally) flagged the end of the search for the right supplier portal strategy and was the starting point for further portal activities. The 'pro Covisint decision' was in line with the corporate IT strategy, emphasising the adoption of standardised ICT infrastructure.

The announcement of this decision can be seen as a milestone in DCs' e-business history. Interestingly, in the end, the decision reflcted not only the GP&S commitment to Covisint, but also the commitment of DC IT. Finally, upon realisation that they did not stand a chance against DCXnet they had given up their security and integration related concerns (upon which their refusal of the Covisint solution was based). DCXnet not only had the budget but was also very closely linked with the TM. DCXnet found itself in the comfortable position of shaping the portal activities on an strategic level but havimg only to coordinate on the operational level – without any responsibility for, e.g., meeting project deadlines. Additionally, DCXnet was responsible for the direct communication with the TM. This gave them some leeway in terms of interpretation of project progress, issues, etc.

5.6 The big partners of DC in Covisint

During the Internet hype, most OEMs had already started to develop their websites to attract end customers and dealers. The extended use of Internet technologies was supposed to contribute to the added value of a company and to help improve process efficiencies (see, for example, GartnerGroup, 2000; Forrester, 2000; McKinsey, 1999). But not only technology seemed to play an important role: speed was another buzz word. All industry areas were lured by the huge promises predicted by GartnerGroup and others, and the automotive industry was no exception.

Companies were kind of obsessed by the idea to gain competitive advantage through implementing Internet-based technologies and adopting e-business. Yet, the focus was largely on sales support (business-to-consumer, B2C; e.g., on improved communication between the OEM and the dealers). However, the much greater potential seemed to lie in improving the communication and collaboration in the area of business-to-business (B2B). Improved collaboration through the entire supply chain, including every business partner regardless of company size, was predicted to offer huge potential for future savings (GartnerGroup 2001; Forrester, 2001).

Ford and GM were the other big OEMs that initiated and participated in the original establishment of Covisint. Ford was the first OEM in this alliance who decided to integrate its already existing supplier portal called "Everest" into the Covisint e-marketplace.

5.6.1 Ford

Since 1997, Ford already pursued e-business activities and used it as justification to start a transformation of the company into a consumer-oriented business. For example, Ford built alliances with Microsoft CarPoint and Oracle in order to have access to leading edge software. Additionally, they nominated

Brian Kelley as a Consumer Connect Group CEO and key vice president in charge of the e-business initiatives. Ford's vision, according to Jack Nasser, Ford President and CEO, was:

> *"We are working to become the world's premier consumer company providing automotive products and services, and to do that, we must also be the premier on-line company"*[29].

In order to successfully cope with the number one competitive concern, SCM, Ford formed an independent joint venture with software vendor Oracle and founded the Ford Supplier Network called Auto-Xchange (www.auto-xchange.com; the link was cancelled after joining Covisint). The scope of Auto-Xchange was to transform Ford's business. Auto-Xchange involved online procurement as well as a suite of advanced supply-chain integration software. Thus, Auto-Xchange was the Ford's first step to open up to a wider audience of suppliers, dealers, etc. As an internal document reveals, Ford's philosophy consisted in starting an open marketplace to target a larger community, with a focus on a greater transaction volume, greater economies of scale, lower prices, and better benchmarking data. It had been the first step towards establishing an industry standard, although not a very successful one (Truhart, 2001). As one former Covisint manager confessed:

> *"Originally, Ford and GM met secretly and were talking about to join forces and kick-start Covisint. As the alignment of interests included also their biggest competitor, DaimlerChrysler, they decided to approach and gentle push them to join as well".*

As the three big OEMs, Ford, GM and DC more or less had the same issues to deal with and were at the same level in terms of the use of Internet tools, it seems quite logical that they teamed-up to set up Covisint. Another good reason

[29] *Ernst & Young*: Proposal to DaimlerChrysler: From Thought to Finish, December 16, 1999, p. 7

might have been the increased purchasing power. It should also be mentioned that Ford and GM approached Chrysler in the US, not Daimler in Germany.

5.6.2 General Motors (GM)

GM started its e-business activities almost in parallel with Ford. The intention was also pretty much identical: to better meet customer expectations by providing the right vehicle at the right time. GM's goal was to re-engineer old automotive business processes, deploy the Internet, and create new value through information products, services, and business ventures. Creating these e-relationships meant that processes and systems across GM needed to be standardised. Apart from extending its network capabilities, GM had been developing several exchanges in order to set up the 'GM e-company', including business relationships with customers, suppliers, dealers and employees (internal documentation of GM).

In 1997, the site was integrated with dealer inventories, allowing potential buyers to configure the exact vehicle they want and find it at a local dealer. In addition, the site offered third-party competitive comparisons, appointments for test drives and the ability to apply online for GMAC financing.

However, GM's most ambitious e-business exchange was targeted towards their suppliers. The goal was to optimise the procurement process for OEMs and suppliers. Therefore, in 1999, in cooperation with Commerce One, GM developed "TradeXchange". The scope and philosophy of GM TradeXchange were considerably different from those of Auto-Xchange. GM TradeXchange attempted to focus on e-procurement rather than the extended network of business partners. Certainly, one of the reasons was that Commerce One simply had no expertise in supply chain management. Additionally, GM TradeXchange was a "closed" marketplace, open only to GM, its suppliers, dealers and invited guests. This was in contrast to Auto-Xchange, which was an open markeplace. Unlike Ford's Auto-Xchange, use of which had been voluntary for suppliers, GM TradeXchange was mandatory for suppliers of GM. When Covisint was

founded, TradeXchange became part of it while being integrated at a very early stage, setting the scene for best practice processes (Lapidus, 2000).
Finally, GM leveraged its exchanges with newly designed business processes and significantly improved its business efficiency. For example, GM cut its product design cycle from 48 to 18 months (Szygenda, 2000).

It has to be noted that other members of the automotive community, such as, for example, Renault/Nissan and Delphi, joined Covisint at a later stage.

5.7 Supplier portals in-house instead of outsourcing – two examples

Unlike DC, Ford and GM, BMW and VW, the other two big OEMs based in Germany, choose the alternative portal strategy. In order to improve integration with their suppliers, they aimed at implementing and customising off-the-shelf (OTS) systems related to their respective proprietary processes.

5.7.1 BMW

In 2001, the BMW Group, located in Munich, realised eighty IT-projects that were part of twenty-eight applications relating to six core processes (product development, procurement, production, marketing, sales, and after sales). Examples of applications include knowledge management, supplier portal, web-EDI, CRM, and Online Car Assist. The e-business strategy targeted the entire company in contrast to earlier DaimlerChrysler IT initiatives which where stand-alone projects. According to Dr. Helmut Panke, CEO, only a holistic approach would lead to the desired improvements within the value chain. Until 2003, the Bavarian car manufacturer invested about € 450 million into the e-business[30].

Two main areas were central to BMW's e-business plans: the product development process (PEP) and the customer-centric sales and production process (KOVP).
PEP refers to the reduction of development time for cars in series. Since 1999, BMW was able to bring down development time to less than 30 months. The

[30] About a quarter of the annual IT cost.

CAD data exchange completely runs via the net. Additionally a web-based innovation bourse was established open for all firms involved in the development process. This effort considerably contributes to the shortening of development time. Within this process, BMW worked closely with about 800 suppliers in order to create interactive networks. Suppliers of modules or systems are early involved in the evolution of these networks (Truhart, 2001).

KOVP covers all processes of the supply chain and order systems, including both the procurement processes and the supplier relationship management (SRM). Especially the SRM organises all information flows necessary for a more efficient OEM-supplier relationship. In the scope of SCM BMW set specific requirements to be realised before a global optimum can be achieved. Several projects were initiated, e.g., the optimisation of the process chain "vehicle", a new production concept, greater flexibility and stability through new production concepts, or a project called "Pipeline of glass "Process chain – Parts" (Mössmer, 2000).

Compared to other players, BMW has a long experience in connecting its suppliers. In 2000, they already started to think about a portal strategy after the foundation of Covisint and after having observed what was going on in the market.

Yet, BMW did not really feel the need to put a portal strategy on top of their agenda because a so-called 'supplier server' had been in place since 1996. After a new release, including a more user-friendly front-end and addressing more topics, this supplier server was used until 2000. The BMW manager interviewed underlines this fact:

> *"[...] BMW had been the first of the OEMs who had a portal implemented. Not in the sense of naming it portal.. it has been at 1996, we offered our suppliers a so-called supplier server. We relatively early had recognised that we need a tool to ensure communication and give our suppliers access to our applications. It certainly had not that much in common with the portal as of today. The functionality for example*

looked totally different [...], we were the first OEM that got linked with its supply base. It had not been named e-business, just electronic communication where BMW was about to set milestones".

In 2002, BMW set up a programme called "Supplier Relationship Management" where all e-business relevant applications were to be concentrated under one umbrella. The programme aimed to control and monitor the various projects related to supplier integration. Within this programme, one of the requirements was to develop a supplier portal with enhanced functionality, such as an improved user data management, the integration of existing applications and new processes for the development of new, Internet-based applications. Besides that, administrative processes in tems of responsibility and ownership required a new strategy.

BMW's portal strategy was clearly focused on the integration of all applications and aimed to give access to all business partners, not only suppliers but also, for example, distributors. Yet, BMW also underlined it strong focus on independence, as they pointed out:

> *"We always wanted to operate our own portal, but we are also ready to link it with other portals, or to use applications out of them, such as Supplyon. However, we did not want to rely on a third party such as Supplyon or Covisint and to give up our own portal"* (BMW manager).

Moreover, the portal should be international and was seen as part of a "hybrid solution or strategy" which left open the possibility to collaborate with other portals, for example SupplyOn. As the BMW manager illustrated:

> *"With a hybrid strategy, we ensure to link with marketplaces outside or we link our applications with another system, like SupplyOn in very special logistic procedures".*

A former business manager of Covisint described his experience after having an acquisition meeting with BMW:

> *"I also talked to BMW who made a point that procurement is their competitive advantage and that they will not pursue any interest at all to give away any of their procurement processes to a third party, whatsoever".*

The portal strategy was largely shaped by the department called 'processes, standards and e-business', dealing with sourcing topics and being responsible for the coordination of BMW's supply base. To some extent, the application owners of existing applications, different business units, also participated in BMW's portal strategy.

5.7.2 The Volkswagen Group (VW)

The case of VW seems quite similar to that of BMW. In 1998, the Volkswagen Group based in Wolfsburg, Germany, reacted to the new challenges within the e-landscape with the creation of SupplyNet that attempted to optimise the communication with about 5,000 suppliers. SupplyNet was the alternative platform to traditional channels such as personal meetings, telephone, or fax to provide collaborative information. The goals to achieve by establishing SupplyNet were the following:

- Provide the suppliers with all important data and information
- Improve cooperation with all suppliers
- Reduce time in communication processes
- Optimise the project work with suppliers
- Optimise cost in affected areas of the supply chain

SupplyNet was some form of a predecessor to a supplier portal, and was subdivided into a public and a closed area. The public part was accessible via a standard web browser. The secure area was only accessible with user identification (Mattes, 1999). In 2000, an e-business unit, which was part of the procurement department, started to consider developing a portal strategy. A VW manager mentioned one of the facts:

> *"We watched the market and we were well aware of what was going on with Covisint. Covisint was the reason why we started to re-think our supplier management".*

One of the reasons which forced VW to re-think their e-business activities was the fact that the existing platform did not deliver the expected benefits and that not every supplier was participating. Additionally, only individual applications were offered which were not integrated in the backend and therefore did not provide seamless integration.

For VW, it was clear that outsourcing their own inter-organisational processes to a third party was out of the question. Together with a strategy consultancy they worked on a cost-benefit analysis and on a technology assessment. The project was driven by the procurement department, particularly by the e-business people within it. In addition, the application owners were included as well as IT people. Within VW, the procurement department has its own IT. In terms of acceptance, suppliers of all sizes were already included in the strategy phase. As the interviewed VW manager describes:

> *"Our intention was to give the supplier a tool which makes his life easier. One does not get acceptance if the users are not asked about their feedback".*

As a VW manager further mentioned:

> *"Naturally, we wanted to get the supplier portal accepted...so we included suppliers of all company sizes, even very small ones to contribute and give us their feedback".*

5.8 Concluding remarks

External and internal triggers forced all OEMs, not only DC, to improve collaboration with their suppliers. Unlike in the case of EDI, the conditions now had changed in two ways. First of all, the target audience were the entire supplier base instead of only tier-1 suppliers. As a result, each OEM had to think of the right e-business adoption strategy in order to connect as many suppliers as possible. Secondly, user-friendly interfaces, Internet-based technologies offered users a simple way to access applications, and could incorporate functionalities which enabled new possibilities of use. These technologies represented some sort of catalyst which allowed not only for new business models, such as electronic markets, but also pushed big players to give up, to a certain extent, their market position they had battled for and to team up with competitors in order to realise the benefits promised by those technologies.

However, most companies initially tried to integrate their already existing individual solutions into a wider network context. In most cases this approach failed, as the example of the eEE programme demonstrated. Eventually, either technical integration difficulties or budget issues forced them to rethink their strategy. The development of an e-business and supplier portal strategy became necessary. The next logical step, as presented in the case of DC, was the foundation of a special e-business unit; in our case the DCXnet department which should coordinate and financially support the development of an adequate strategy, including a later implementation.

However, DCXnet experienced the same difficulties as did GP&S with their eEE programme. DCXnet was seen with mistrust by both the IT and GP&S departments. The founding of DCXnet was a bitter pill for GP&S and IT to swallow as it rendered superfluous much of their earlier work. Additionally, both had fought for an e-business budget of their own, to adopt their own e-business projects. Yet, they had to accept a new player with a huge budget for e-business projects.

As DCXnet were assigned by the TM to be the budget holder and coordinator of the GSP project, IT and GP&S showed a certain level of respect As already described, DC is a very traditional organisation with a grown structure and history. Within this historical context, both departments thought that it would not be easy for DCXnet as it was a young department and still had to perform. Additionally, IT as well as GP&S were very well linked within the corporation (knowledge networks), had very detailed expertise of their business processes. They thus thought that time would work in their favour.
However, a certain level of respect stemmed from two facts. First, DCXnet was located in the same building as the entire TM and had established a very well functioning communication line with them. Thus, the close proximity of DCXnet to the "power" of the TM caused certain uneasiness at IT and GP&S.

The portal strategy chosen by DC shaped the development and implementation of standardised portal technology, which is presented in the next chapter.

Chapter 6. DEVELOPMENT and IMPLEMENTATION of a STANDARDISED SUPPLIER PORTAL

6.1 Introduction

The previous chapter has introduced the process of how DC and the other actors involved in the global portal project decided upon the portal strategy. Eventually, the decision was to adopt an 'industry standard solution' which was offered by a third party – the e-marketplace Covisint. In this chapter, the focus is on the development and the implementation of standardised portal technology (and business processes) as part of the Global Supplier Portal (GSP) project. During the course of the portal project, the development and the implementation phase were tightly intertwined.

This chapter is organised as follows. In the first section, an introduction to the set-up of the GSP project in terms of project organisation and project plan is provided. The subsequent sections discuss the main GSP project deliverables: the Statement of Work (SoW), the development of the user interface (UI) / content management, the technical integration of the GSP portal into the technical IT architecture of DC, the development of the portal administration and the concept development for the portal governance. In the conclusion, the different aspects that emerged during development and implementation are summarised and reflected upon.

6.2 The portal project kick-off

In January 2002, after the public announcement by Gary Valade of DC's decision to develop a global supplier portal with Covisint, the first preparatory project activities started very soon. The goal was to set up a global and interdisciplinary project team for the project "Global supplier portal" (GSP) with members from different business units from both Auburn Hills/Detroit (US) and Stuttgart (Germany), Covisint, as well as IBM consultants. A former DCXnet manager summarised the start the start of the project as follows:

"The portal implementation touched many functionalities across different business units. This was the reason why an integrative project approach has been chosen. It has been the same people like in the strategy phase before. Besides, DCXnet, procurement, logistics and IT have been actively involved. A statement of work, the portal user interface, the integration of the portal in the DC architecture and the registration/migration of portal users were the first and most important milestones to achieve".

6.2.1 Portal project organisation

Only a small group of managers of DCXnet, GP&S and IT departments had participated in the strategy phase (see chapter 5). For the development and implementation phase also business managers with a strong process background from other departments, experienced application owners and IT operations and IT security staff were brought in. Additionally, during both phases of the portal project, IBM played a more important role than in the strategy phase, where they only facilitated the development of different strategy scenarios and portal integration patterns for architectural purposes.

A complicated and coordination-intensive project organisation was put in place. The idea was to get the buy-in of everyone even if it was clear that the people concerned were pursuing different agendas (that were not always openly known and discussed). The aim was to involve all stakeholders to such a degree that later on nobody could claim lack of information or of opportunity to express opinions. This had been a precautionary measure by the portal sponsor group to limit the risk of a possible non-acceptance of the portal by well-established business unit leaders.

Figure 27 illustrates the complex project organisation established with the objective to incorporate everybody who should be included.

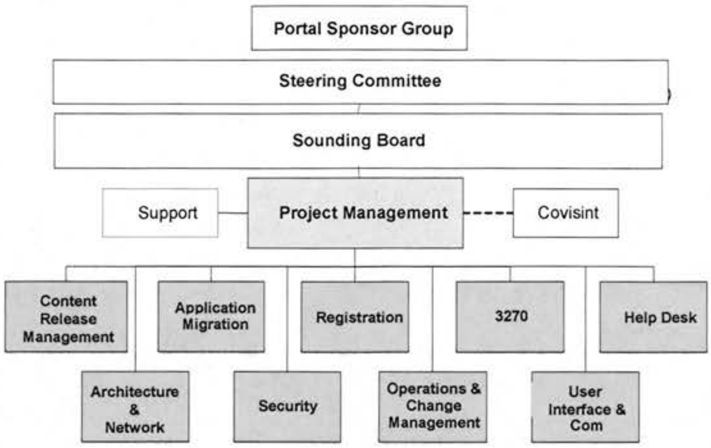

Figure 27. Project organisation of the GSP (Internal documentation)

The GSP project organisation comprised four different groups: the portal sponsor group, the steering committee, the project management and finally, the nine different sub-project groups.

In the **portal sponsor group** the Board of Management member Gary Valade was representing GP&S, Olaf Koch was the DCXnet representative (and leader of DCXnet, closely linked with the TM and the CEO of DC) and Sue Unger, Chief Information Officer (CIO)[31]. As the GSP project involved all three business units, these people were responsible to ensure that their different departments were "on target" with the objectives the project sought to achieve. Additionally, the portal sponsor group was responsible for implementing the portal strategy and was the budget holder. At irregular intervals, the steering committee had to report to them about the project progress.

Apart from the DC representatives of GP&S, DCXnet and IT, the **steering committee** included a representative of Covisint's top management as well. Whereas the portal sponsor group acted more on a strategic level, the steering committee was responsible on a more tactical level. They had to deal with deadline extensions and budget adjustments, and were also responsible for solving any issues with regard to the collaboration with Covisint on the

[31] Unger is not in the Board of Management although IT plays a very dominant role within DC and she is quite frequently interviewed in relevant IT journals.

management level. Additionally, they should ensure the smooth project operation which turned out to be challenging due to the interdisciplinary character and multicultural approach of the project. At least once a month members of the project management team had to report to the steering committee about results achieved as well as about issues that had come up and could not be solved by the sub-project group leaders.

The **Sounding Board** included all relevant business unit directors of GP&S and the IT departments involved. This group of people was well established within DC, and they saw themselves as 'conscience of the corporation/project'. They objected heavily[32] to some of the decisions taken by the steering committee because they felt being in a disadvantaged position with their business unit compared with other business units. As each of the sounding board members was representing his department, each had his own agenda. At least every three months there was a meeting of the sounding board, the steering committee and the project management team. The sounding board liked playing political games; for example, to agree to decisions in a meeting and to retract this later on. In some cases members of the sounding board even denied having supported decisions related to the GSP project (one of the big issues here was, for example, the governance of the portal after its shift from project state to a 'normal department').

As illustrated in Figure 27, the **Project Management (PM) team** included only DC people with a business background from GP&S and IT, supported by other DC business units if and when necessary (e.g. the legal department), DCXnet, IBM and by a Covisint project manager. The PM team was responsible for the smooth daily project work. A project management leader had been nominated who was responsible for the nine sub-project groups. The sub-project group leaders had to communicate and clarify issues with the project management lead on a regular weekly basis, except for urgent situations where telephone conferences were arranged.

[32] Minutes were taken within meetings of the Sounding board and/or the Steering committee, unfortunately publicly not available.

Each of the nine **sub-project groups** (such as, for example, application migration, help desk, etc.) was led by a sub-project manager responsible for the respective team. In total, there was a core team of about 40 to 50 dedicated people plus another 30 people who joined if necessary. On the European side the team consisted of only about 10 people from DC (two of DCXnet, four of GP&S and four of IT); most project team members came from Detroit. The reasons for this were twofold. First, it was difficult to find qualified people in Europe and to get those on the portal team on a full-time basis. Second, the European team members had to work in different sub-project groups in parallel because business unit managers did not want to lose too many people to the portal team. Yet in many cases this was an advantage compared to their US colleagues as communication was much stronger, and therefore collaboration and problem- solving were simplified.

A web-supported e-collaboration tool was developed to ensure project communication/documentation between the portal teams, complemented by regular video conferences (at least once a week) and face-to-face meetings both of and within the different project sub-groups, or of the sub-groups and the steering committee. The face-to-face meetings took place on a monthly basis, at both Detroit (US) and Stuttgart (Germany). In some cases, when issues could not be solved during phone conferences, people also decided spontaneously to meet in person, thus incurring additional travel expenses (see the following section).

From the beginning, the use of the web-based tool turned out to be cumbersome because no-one within DC could explain how it works. The tool basically lost its acceptance when it took more than two weeks to obtain logins and passwords. Even with a login/password, it took a long time to start the software. The software design was not very user-friendly and caused difficulties in finding existing documents or saving new ones. Consequently, the project team started to email many files back and forth which caused trouble as it led to different versions which were not synchronised. In the meantime, the project management team set up a document infrastructure within the DC mail system (Lotus Notes) which was not user-friendly, either.

Typically, the European team members were well prepared during video conferences with their US counterparts. During these sessions it became obvious that the Americans needed quite a while to settle themselves in the video conference room. Moreover, the management was not as tight as in Europe. Frequently, they were less than well prepared, and as a result many issues could not be discussed properly. Most Covisint team members came from US. The European team of Covisint comprised only 5 people, who were in charge of all Covisint clients in Europe. This was the reason for frequent complaints about a lack of support from Covisint Europe by different sub-project groups.

Clearly, this created considerable trouble for both sides, DC and Covisint, as it was quite obvious that the "newbies" had no clue of the current state of the project, nor, in some cases, had the professional background to take any responsibility so badly needed right from the start. A DC manager interviewed remembered:

> *"The more such things happened, the more we lost trust into Covisint and in its business and people. The pity was that we as a portal team also lost credibility within our own company. From my perspective, some of the things which happened could have been easily solved with a more open and honest communication. Sometimes, I missed the understanding for our needs at Covisint".*

6.2.2 Portal project plan

A project plan with milestones (depicted in Figure 28) was developed within four weeks. As shown in the figure, the GSP project was subdivided into 9 sub-projects, including content management, application integration, registration, 3270[33], helpdesk, architecture/network, operations & change management, and user interface & communication.

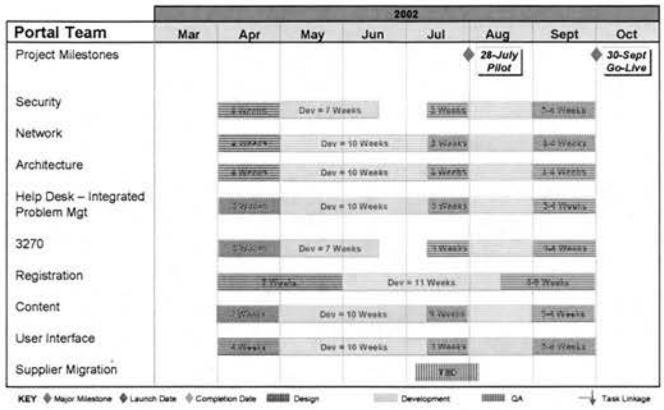

Figure 28. Project plan GSP (Internal documentation)

Emerging issues and the progress within the individual project sub-groups were tracked by DCXnet in a dedicated "activity tracking list". In this list, for each of the nine sub-project groups ongoing developments were marked with green for "being on time", yellow for "time critical", and red for "issue". The understanding was that the different sub-group leaders had to feed the information from their teams to the DCXnet person responsible for the list. One core feature of the project plan was the diversity of the important deliverables that needed to be produced. The 'going live' of the portal pilot after the first phase was planned for end of September 2002, only nine months after the first public announcement of the project.

6.2.3 The deliverables in the project plan

As shown in Table 7, the main deliverables included

(1) the SoW

(2) the development of a UI for the supplier portal (this also included the integration of dynamic content and the selection of a content management system)

(3) The technical integration of the portal technology into the DC IT infrastructure, including the migration of existing applications and users

[33] 3270: old host system used in US.

(4) the development of administration/registration processes, and

(5) the portal governance model

Work on the first four deliverables commenced in parallel right from the project start whereas the portal governance topic only came up in the context of the content management, and therefore started at a later phase of the project.

Table 7. Overview of deliverables and characteristics

#	Deliverables	Characteristics
1	Statement of Work (SoW)	▪ Service contract to define co-operation btw DC and Covisint
2	User interface (UI)	▪ Design of homepage ▪ Structure of pages ▪ Personalisation ▪ Functionalities ▪ Content Management
3	Portal integration	▪ Integration of portal architecture in existing IT infrastructure ▪ Security ▪ Application integration
4	Portal Administration	▪ Registration (supplier agreement) ▪ Migration (User data management) ▪ Roles and responsibilities
5	Portal Governance	▪ Set-up of organisational/process structures

The first deliverable, the SoW was supposed to arrange the 'who is responsible for what and who pays what' on a formal basis. The second deliverable was the user interface which consisted of the design and the structure of the portal web site. Important aspects to consider regarding the portal vision were personalisation and the functionality of all portal pages. Closely linked to that was the page content and how the relevant information could be properly structured and displayed. The most important aspect of the third deliverable, the portal integration was to be technically integrated in the GSP architecture of the existing DC architecture. Further topics in this context included security and the integration of existing applications that were actually part of other portals. The fourth deliverable was the portal administration that consisted mainly of the registration of new users and administrators. Other key aspects associated with the portal administration were the migration of existing user data and the allocation of the portal roles and responsibilities. Finally, the governance of the portal, i.e., the structure of a portal organisation after the portal had been established, was on the agenda.

The development of the five deliverables will be discussed in detail in the remainder of this chapter.

6.3 Statement of Work

Once Gary Valade had announced the decision to set up the supplier portal with Covisint, the IT department insisted on pursuing the creation of a service agreement with Covisint - the "Statement of Work" (SoW). First of all, this was the normal procedure which was in place with every third party service and, secondly, IT wanted to ensure that the rights and responsibilities were clear for each party involved. The SoW was therefore drafted in parallel with the official start of the project. The initial plan was to have the SoW ready at the end of March 2002 in order to proceed with the project on time. The SoW was supposed to be a sort of agreement with contract character between DC and Covisint, incorporating exactly the detailed services Covisint should provide, and it should also define the scope of work associated with the GSP project.

Apart from the definition of the different portal services of Covisint (for example, the hosting of the portal, the provision of the user registration system, etc.), the SoW should cover some project assumptions (for example, defined types of portal integration, who is responsible for what, etc.), the scope of services and finally, the deliverables and milestones plus the fee structure. Initially, the SoW had been developed by Covisint US in close cooperation with the IT people of DC US because of the proximity of the company offices. For a start, DC had sketched out the main topics which should be covered in the SoW and provided them to Covisint. The first draft of the SoW was provided by Covisint in late February 2002. In total, the document consisted of more than 100 pages, including technical annexes, special agreements (for example, the hosting service agreement) and different attachments.

However, the SoW development process took much longer than estimated by DC. Several reasons were responsible for the delay. Firstly, Covisint and DC had agreed that DCXnet Germany should be in charge of the coordination and correct contents of the SoW, backed-up by the IT people from US and Germany. In a scheduled meeting the document was discussed by DCXnet and IT Germany. This meeting lasted almost a day and the Germans were quite concerned about some aspects in the SoW. They felt that many sections of the document were quite vague, giving Covisint the freedom to interpret them in one way or the other.

The document was returned to Covisint with feedback and concerns within a few days. After the initial feedback round, the main areas of concern became clear, and did not change over the next six versions. The need for constant revision of the document was due to the cultural differences and language difficulties (US vs. Germany), tentativeness of both sides (Covisint and DC) and the relatively inexperienced Covisint organisation. DC in general, and particularly the IT department, intended to have a written statement clearly describing roles and responsibilities for each service to be provided by Covisint; this was the usual procedure. As the GSP was the first complex project for Covisint, they seemed neither prepared nor experienced and were astonished by some of DC's responses. The former Covisint project manager was quoted to have said when he saw the first feedback of DC that:

> *"They really had used the 'track changes' option of Word...and everything was red. Apart from the fact that the document is twice as long as it had been before, I cannot believe it".*

In contrast, due to the fact that there was no valid SoW in place during the whole first phase of the project, some of the issues still remained in the category 'open issues' during the implementation phase. This held particularly for the integration of the portal into existing IT infrastructure, and for the application integration. One of the IT managers considered this was down to a lack of existing processes which caused a blurred definition of specifications. He stated:

> *"I think, much of IT projects run into problems when the specifications of the customer are not worked out in detail; in the beginning and, during the project phases when changes occur. This is a critical variable and when a certain date has to be achieved, these variables are really very disturbing and cannot be cleared away or ...they are just there. This also happened in this project. Primarily, I think, the main reason for the difficulties had been that processes were not described in such detail as it was required".*

IT US and the US management of Covisint did not have the same level of concern for many issues raised by German DC project members. Whereas the Germans worried about the definition of the service level agreements, particularly about the coverage of events such as the guarantee of the portal system availability, operations and maintenance and an adequate reporting of errors, their American colleagues did not see these aspects as main issues. The question of who (DC or Covisint) would be responsible if the portal were not available to suppliers was a particular concern of the German side. This became one of the hot topics during the development of the "supplier portal agreement". This agreement was worked out together with the legal department of DC and should cover aspects such as portal availability, etc, and should also define who was responsible for what. For example, in the case of the non-availability of the portal, DC would give Covisint the entire responsibility because Covisint was hosting the portal infrastructure.

In addition, due to cultural differences within DC, the development of the SoW was difficult. Originally, the SoW should have been driven by DCXnet, but in truth it was pushed very heavily by the German IT department and just checked by their US colleagues. The latter did not fully understand the very detailed requirements of the German IT people. A IT manager involved stated:

"At the beginning, we had a specification phase where we commonly defined with Covisint our requirements. The original plan was to spend 4-6 weeks to fix all specifications needed from our side. Then, the outcome should built the SoW and be the basis to realise the portal".

From the beginning, Covisint struggled with the 'hard deadlines' identified in the project plan's milestones, particularly set by the DCXnet management who were under pressure internally to prove that the Covisint strategy would be a success. Additionally, the nine different sub-projects generated problems for Covisint. They did not have the staff required; hence it was difficult for them to send the required specialists to the working groups. In the end, most of the working group meetings included the same staff from Covisint. This caused difficulties for example in the agreement of special needs to be integrated in deliverables. This behaviour caused a lot of frustration within the DC project sub-teams. Their perception was that Covisint did not treat them as proper clients and that Covisint staff did not have the appropriate expertise. In addition, the fact that Covisint had only a few staff in Europe, and that those people only showed up very rarely, caused further distrust and unease.

Another enormous area of concern for DC was the design of the overall portal architecture. For IT, it was unclear what would be available in terms of Covisint infrastructure, and which additional gateways would have to be programmed. This, in turn, caused additional costs that could have been an issue with regard to the original project budget. Furthermore, this led to the need for clarification concerning the question as to who (which department) was responsible for such additional costs. As a IT manager mentioned:

"Covisint gave us a very hard time when we tried to find out which of the Covisint solutions would cover our requirements and what was supposed to be developed new. There had been very controversial discussions in terms of

the portal architecture itself and their integration into our IT world, where we did not agree with Covisint ideas".

As it was quite obvious during the development of the SoW, a high degree of communication and clarification were needed. Covisint staff came far more often to Europe than planned beforehand[34]. Consequently, the budget estimated for travel expenses did not cover the real cost and had been subject of re-negotiation. In the beginning, when Covisint mentioned that the travel expenses could be an issue because the travel budget was too low, DC argued that they had already spent more to cover Covisint's travel than originally planned. They further argued that Covisint also had to invest resources (manpower and money) because the GSP project had a sort of reference character for Covisint.

Eventually, the seventh version of the SoW document more or less satisfied DC and Covisint; the re-work of content was stopped by the TM. At the end of July 2002 the DC project manager was about to collect the signatures of the responsible managers. At the same time the implementation of the user interface began to take shape.

In parallel with the SoW, the development of the GSP UI with its complex structure of pages was addressed. Unfortunately, according to the IT people, the apparently 'simple task' to conceptualise a user interface had given rise to a number of significant problems, described in the following section.

6.4 The GSP UI

The work on the design of the GSP UI started immediately after the official start of the project. Although GP&S had the lead for this deliverable, the main 'driving force' was DCXnet. The IT department had only been involved with

[34] Some issues were popping up in every discussion and simply could not be fixed by sending emails or having phone conferences. Even video conferences were not applicable in some cases to solve problems or to clarify misunderstandings.

respect to the technical feasibility of portal pages' functionality in the IT architecture.
In this section, the development of the GSP UI and the page structure as well as related content management is described.

6.4.1 The Creation of the UI

The portal UI was supposed to reflect Valade's DC collaboration vision, outlined in detail in chapter 5. The GSP UI to be developed should support an easy navigation through the web site. Other aspects to be considered included the personalised and integrated access for suppliers, portal functionality and the related information provided. As the UI was the first concrete deliverable and represented the interface to the outside business world, the development and implementation took far more time than originally expected.

DC used some sort of guideline which reflected the idea of a supplier portal that had been developed by DCXnet and GP&S during the first UI workshop:

(1) one workspace for Covisint and DC applications worldwide
(2) the integration of all regional initiatives worldwide while catering for local needs (this was called "Glocalisation"[35])
(3) web-based communication with suppliers that should reflect the DC supplier philosophy ("supplier partner approach")
(4) the provision of up-to-date and regularly updated information about DC projects and supplier bulletins.

The general concept of the GSP pages had to be built upon the Covisint 'Trading Partner Pages' and was influenced by organisational, social and technical factors.

In the UI sub-project team, the main issues and discussion points with regard to the user interface design centred on the general concept of the GSP homepage and the related portal pages, integrated in the Covisint pages. Other topics were functionalities to be provided in the different views (for registered and non-

[35] Glocalisation is a mix of globalisation and localisation. The term was introduced by de Ruijter (1997).

registered users, respectively) and their integration into the portal. One of the interviewees illustrated the objectives:

> *"One of the first activities had been to figure out the different ways suppliers should get access to the global portal and what the entrance page should look like. Not only from a "look and feel" point of view but also in terms of what information should be presented on the main entrance page..[...]".*

According to the SoW, the portal service would provide two types of pages: the public pages that a non-registered user could see, containing more general information, and the private pages for registered users requiring a log-in. If a non-registered user entered Covisint's public portal page of DC, this public view would feature a navigation structure based on four main "tabulators" (tabs) which were:

- **'My Covisint'** tab – contains pages (represented as 2nd level tabs) each of which contained portlets[36]. The pages can be customised by portal administrators and users.
- **'Covisint Solutions'** tab – lists all applications which are available from Covisint such as collaboration, procurement, supply chain, quality
- **'Trading Partners'** tab – directory of Covisint partners with their general corporate information. If a user is registered to the service of a partner, this site might include more information (e.g. the subset of applications he is registered for)
- **'Help'** tab – general information for assistance (training material / FAQs / help desk, etc.).

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[36] Portlets are web components, usually managed by a container that processes requests and generates dynamic content. Portals use portlets as pluggable user interface components to provide a presentation layer to information systems. A portlet is defined by several elements such as the portlet name, the content location, content source or change frequency, number or editors, etc. Portlets are part of an open portal architecture that is based on Java/XML and enable, for example: interoperability between portals and portlets (any portlet runs on any portal), interoperability between content providers and portlets (portlets access sources of similar content through standard protocols and formats), and dynamic integration of business applications in portals (remote portelet web services).

After the very first workshop, during which time the portal design guidelines were developed, the UI team in Stuttgart started to draft the general design of the portal pages and to develop a concept of the overall structure the site and of the navigation structure. The intermediary results were sent to the rest of the team based in US for feedback and comments. Altough GP&S was supposed to have the lead in this sub-group and time was running, they had difficulties in both setting-up a proper portal page structure/navigation as well as finding a creative design for the pages. This was largely due to a lack of experience. Therefore, one more Internet-experienced and very ambitious person from DCXnet kick-started the design and development process by emailing some of his ideas to the rest of the team. During the next working meeting, his ideas were discussed and most of them were adopted for the design of the portal pages. The first difficulties and issues were about how the pages should be structured in general and particularly regarding the integration of the different portlets and the page style (fonts, colours, etc.).

In terms of the page structure, the idea was to use the same 'three column' format as the Intranet pages in order to be in line with the Corporate Identity (CI) guidelines which specified how DC would like to present themselves internally and externally. This decision to use the same structure as for the Intranet was agreed very fast within the UI team. The questions about colours and fonts were more challenging. While emailing draft structures back and forth between Stuttgart and Detroit, it turned out that both locations had different CI style guides to create the pages. The US colours were very loud, for example, whereas those of the Germans showed the typical conservative style which was characteristic for DC. After having discussed the guidelines internally, the different UI interface style guides were integrated parallel.

In the meantime, all draft portal pages were also sent to Covisint. Their UI team produced 'mock-up's'[37] based on the design proposals that were sent to DC. Quickly it became clear that Covisint was not able to present the DC colours properly with the technology they used. However, team members in the US were far from being as critical with Covisint as the German team members were. Covisint very well understood the issue but insisted on the fact that their portal technology represented an industry standard and that DC had to adapt to it. This statement had been a great shock for the UI team. After all, the struggle they had gone through during the integration of the different CI style guides, and Covisint now argued that their solution would be the standard and had to be accepted by DC.

This was an issue which was escalated to the steering committee. DC's point of view was very clear on that matter: they would never change their CI guidelines only because Covisint pretended to have an industry standard CI. The project management team of DC basically had no choice but to adopt this position because the communication department, which was also responsible for the CI, had been alerted and tried to get access to the portal project in order to sustain its position. This was not what the project management team wanted because this would have been another unit to come to an agreement with. The portal management team already was more than large enough, and additional 'trouble makers' were not really appreciated. In retrospect, an interviewed GP&S manager mentioned:

> *"First, we had to find the design and define the content of the GSP homepage. Here, we started to look on the Employee portal to get an idea of what should be on the main page. Then, step by step we worked on the first designs which we emailed regularly to our team colleagues in the US to discuss and get their feedback. It turned out that US had a totally different perception of the corporate identity (CI) rules than we had. For example in*

[37] Mock-up's can be run easily on each PC with a browser. They simulate the navigation through the designed pages and are very valuable for feedback purposes.

terms of colours and design when we conceptualised the DC supplier portal home page".

However, in the end a compromise was negotiated that combined the idea of the Covisint industry standard portal design and the DaimlerChrysler Corporate Identity guidelines, illustrated in Figure 29.

Figure 29. GSP implemented UI (Screenshot as of 2002)

On top of the page the three tabs 'Home', 'Applications' and 'References' are located. The page shows a two column approach instead of the originally developed three column approach. On the left hand side, portlets that could be personalised by the user, general links and Covisint applications could be found. At the top centre of the page the 'DC Bulletins' announced the most recent news for suppliers, followed by the announcement of new software updates. At the bottom half of the page, more internal information about the supplier programme 'Extended Enterprise' and 'Locations worldwide' were provided.

The 'three column approach' and its adaptation to the GSP pages represented an organisational and technical constraint for Covisint. This was due to the fact that similarity to the DC Employee Portal and Chryslers' 'Dashboard' could not be provided by Covisint's technology. Technically, Covisint was only able to present the pages in a two column version which meant that DC feared to loose their brand recognition for DC portals. These technical constraints coupled with organisational issues caused a lot of discussion between DC and Covisint. Despite the continued attempts of DC to press for the 'three column approach', Covisint continued to have difficulties to cope with the DC UI requirements in terms of brand and components/content to integrate. This included, for example, the user customisation within the private view of the GSP page which had originally been an important objective for DC.

Another hot topic was the functionality to be provided by Covisint and their integration into the different portal pages, e.g., portlets. During the design of the general concept for the GSP pages and the UI, the requirement of DC to re-use portlets was supposed to be beneficial with respect to cost and effort in content management. For DC it would be extremely beneficial to use portlet functionality to link with DC Intranet websites. The goal was to reduce content management efforts, keep information current and not to reproduce it several times. This held, for example, for the DaimlerChrysler Bulletins, which provided the most recent information to meet the needs of regional users (North America, Europe, Rest of World) and functional areas (e.g. development or procurement).

Key characteristics of using portlets for DC were that applications could be displayed as part of a page or as a separate page and that portlets could share content. Major advantages in this context were seen in the user customisation of portlets (individual selection), and the ability of portlets to communicate with each other. After an analysis of portlet capabilities DC identified a number of portlets which could be managed with Covisint's content management system and others which were time critical (for example, 'Daily News', 'worldwide locations'). Time critical portlets were to be managed through the web-based interface solution that Covisint offered.

Unfortunately, due to misunderstandings between DC Europe and DC US, the negotiations about style, structure and technical feasibility between DC and

Covisint took longer than expected so that the GSP UI was delayed for more than four weeks. In the end the GSP team, including Covisint, reached some sort of compromise about the design and the content of the pages. DC had to give up some of their requirements such as the identical 'look and feel' design whereas Covisint had to change their whole technical portal infrastructure. During these discussions about the realisation of the GSP pages, it became more and more evident that the technical requirements of DC would not fit with the technological basis of Covisint. This was the reason why Covisint had to change their technical platform from a 'best-of-breed' approach to the IBM 'Websphere' platform. Also, Covisint enabled portlets on the DC trading partner page for personalisation; this had not been technically feasible before.

In total, the design of all pages took longer than originally planned as a lot of coordination work between the DC team members from the US and Germany, and between DC and Covisint was required. An important and vital part of the UI was the content management described in the following section.

6.4.2 Content Management

The content of a supplier portal is a vital part of this communication instrument due to importance in terms of acceptance and use of the portal by suppliers. Within the development of the GSP UI, the content aspect gained momentum and raised a number of questions and issues.

In the SoW, Covisint proposed to load the content provided by DC into the Content Management system for the initial launch of the portal. For the time after the launch they promised to develop an interface to enable simple uploading of new content. During the work conducted by the UI team it became clear that some of the portlets would need a daily or even hourly update. If those portlets were part of the GSP, the content would have to be updated on time. Although it was clear that Covisint would put in the content manually for the start of the portal, DC became more and more aware that this would not be what they really wanted. Due to the fact that this was an on-going issue in the negotiation of the SoW, and that the awareness of the timelines of some portlets would make a more automatic content update necessary, DC (and IT in particular) pushed Covisint to come up with a draft solution.

As already mentioned, one of the huge advantages of Internet-based portlets is the re-use of already existing ones, thus reducing content management costs. Again, as stated in the SoW, Covisint's suggestion was to provide a web-services- based interface to connect DC's existing Content Management System (CMS). However, this would not have been ready for the start of the portal. At this point, DC-internal organisational issues occured that were related to the process of information actualisation and information sharing. Business units started to become suspicious and asked the portal team about BU-specific content and processes. As a GP&S manager mentioned:

> *"They wanted to know exactly what content, in which form and how often they should provide it. They also feared that we would start to control how often they renewed it".*

DC was forced to rethink their content publishing process; no standardised procedure had been in place so far, not even for the old portals. Yet, they felt that this issue was becoming quite urgent and had to be solved. Therefore, GP&S's idea was to transfer the content after the internal approval (here, it was not clear who would be the right person/department to approve) through a web interface to Covisint. Then, the changed content had to be updated and stored at Covisint. As a DC manager stated:

> *"There was a discussion about whether the content should be provided in a static or dynamic form, how often it has to change, and from which sources it should be fed in. The longer the discussion went on, the clearer it became that, even internally, we had no standard process in place to provide a supplier portal with current content and information".*

Additionally, due to fact that DC and Covisint had two different CMS, it was technically not possible to integrate much of the already existing portlets. In addition, the web-based interface solution from Covisint was not a real alternative because it was believed to interfere with security policies. This was a major drawback to the original idea to re-use portlets at least for time critical information.

At this point in time, the IT people joined the content discussion which was led by GP&S and supported by IBM. IBM was expected to support GP&S with a solution in the near future, i.e., at the launch of the portal, expected for the end of September 2002. The UI team, comprising of GP&S people, was not experienced at all in terms of technical solutions. Thus, they did not understand what IBM proposed. They only understood that a solution would mean extra effort and budget. Therefore, they moved IBM's proposed alternative solutions to DCXnet which was responsible for the budget, but DCXnet did not have the necessary experience to judge IBM's proposal either. Thus, they approached the IT people. IT had several concerns. One of them was the security aspect (see also 6.5.2), the other were the estimated costs and efforts for programming and integrating the alternatives. Although IT collaborated with IBM in several projects, and IBM was the strategic technology partner, IT always presumed that IBM only wanted to make money rather than look for solutions which would suit DC. The involvement of IT led the content issues being on the agenda of every meeting and video conference. Covisint's point of view was that they would provide an interface after the initial launch of the portal. They argued that the fact that DC and Covisint had two different CMS should have been clear for all parties involved right from the beginning of the project. After many discussions and a cost estimation, it was finally decided to meet Covisint half-way and to implement a web interface on the DC side as well, through which the content from different sources could be uploaded automatically.

The sub-project group leader of the content management team did not really push the issue of the two existing systems. However, IBM was keen to present several alternative 'content integration concepts'. To them is was clear that neither DC nor Covisint would change their CMS. DC still had the strong belief that they could influence Covisint, as in the case of the portal technology, and in the end push them to use the DC CMS. After many discussions between Covisint and DC it became clear that the project team had to technically integrate two different Content Management Systems (CMS). Although Covisint offered a special web interface to transfer DC content to Covisint, the IT manager, backed by different other IT departments, decided to develop a separate web interface for content transfer, to be hosted at DC.

This urgency to have standardised processes in the content area was increased after the sub-project group had started to compile content for the GSP from the GP&S functional departments. Responsible GP&S managers did express their concerns about what would happen to the content, or were very suspicious about the entire GSP undertaking. As the responsible team had no answer to most of the questions, the corresponding standardised content management processes had to be defined. Taking into consideration the already drafted future portal government model, the project team worked out a couple of standard content management processes[38]; the one for a change request is shown in Figure 30. The figure portrays the different stakeholders who were represented and the necessary process steps related to content changes. Based on the developed process, each party's roles and responsibilities in case of a content update were included.

[38] Apart from the portrayed process, standard processes were defined for translation of portal content, content transfer to Covisint (short-term), content transfer from different databases and a standard process for the Supplier Bulletins.

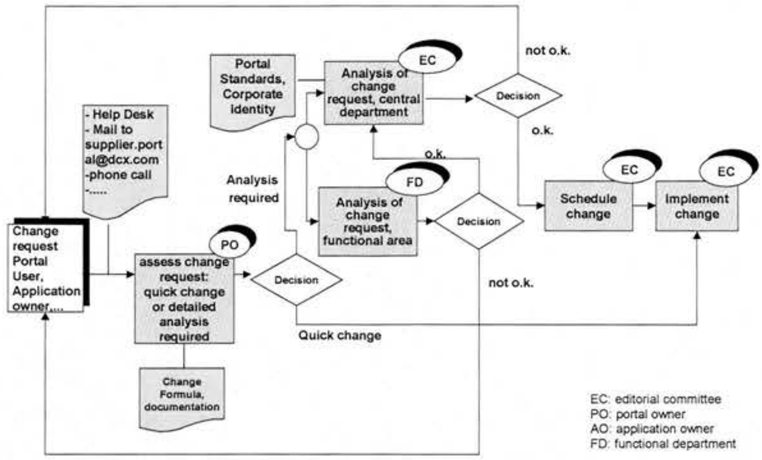

Figure 30. Content management process (Internal documentation)

These new processes were presented to the steering committee and the sounding board in order to get the commitment of the business unit leaders. Subsequently, to communicate the agreed content management model internally, the communication department of GP&S set up a communication plan to widely distribute the information about the new process.

In terms of the portal/content responsibility aspect, the content team eventually came up with the idea of an editorial board that should include representatives of all business units affected. This was addressed by the project management in the steering committee. They took this issue very seriously and gave DCXnet the mandate to work out a concept of how a portal organisation could look like after the project phase. This will be discussed in more detail in section 6.7. Consequently, the content management issues were not solved within this deliverable and continued to be an open issue for the rest of the project.

The integration of different systems and the corresponding processes were not only part of the UI but were also part of the overall portal integration described in the next section.

6.5 Portal integration

A key challenge was the integration of the portal architecture and functionality into the existing corporate IT infrastructure. Especially with regard to security policies, the single sign-on (which enables access to different information sources and applications with only one login and password) was not only difficult to implement in the overall IT infrastructure but was also a challenge in terms of the integration of the existing portals.

6.5.1 The technical integration of the portal

The portal integration was driven by the different IT departments[39]. Although IT had the lead for this deliverable, DCXnet took the role of a facilitator and coordinated on-going negotiations between DC and Covisint on how to sustain the project progress, to avoid deadlock situations and to be on track with the project budget. Generally, the first phase of the global supplier portal (GSP) was characterised by internal and external constraints, such as time and lack of information about Covisint's technical abilities. At the beginning of the project, in order to meet the ambitious deadlines, the time to achieve certain milestones had been calculated very tightly by DC team members. Therefore it was very difficult, even for them, to specify all requirements accurately, and to cover all contingencies. Also, due to the enormous time pressures, it was not clear for IT (and neither for DCXnet, but they would never have expressed this in public) whether or not Covisint could meet the IT integration requirements of DC. The IT people expressed their fears very openly, not only during the team work in the sub-groups but also at meetings with the project management and the steering committee. As an IT manager of DC pointed out:

> *"At the beginning of the portal project, we only had a very short specification phase where we attempted to define our requirements with Covisint. There had been controversial discussions between Covisint and us in terms of architecture, where we did not agree to the ideas of Covisint. In addition, due to our own portal experience, we knew that time was too short to do a proper job and that it would not be easy for Covisint to take into consideration all our requirements".*

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[39] People in the IT focused sub-groups were from different IT departments of DC such as IT/M (IT Methods), IT/P (IT Processes) or IT/S (IT Security).

Within this part of the project, one of the first basic objectives was to integrate the two existing supplier portals of DC Germany and DC US into Covisint. DC US had about 200 applications and 8,000 supplier-users, DC Germany had 11 applications and 2,000 supplier-users. After a review of Covisint's portal solution by IT, Covisint had to change the technology provider. Their original portal solution was based on a Oracle/C1 solution upon which the Ford supplier portal was also based. However, DC forced Covisint to accept the IBM Websphere technology. As most of the IT architecture is based on IBM, DC justified this approach with its own strategic partnership with IBM. Consequently, Covisint had to change their portal technology. They switched to IBM websphere because they wanted to facilitate and to fast track the integration of the portal solution into DC's IT world. For Covisint, this fundamental change in technology had both inconveniences and advantages. With respect to the latter, Covisint aimed to sell this newly released portal solution to other customers[40]. Regarding the former, Covisint had to invest additional money. Figure 31 illustrates the detailed integration approach for the old portals after the new agreement with Covisint.

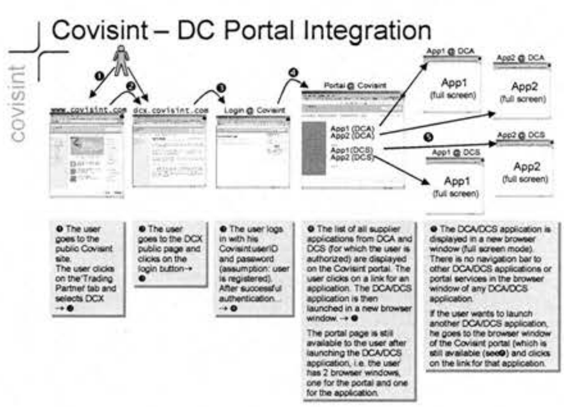

Figure 31. GSP integration with existing portals (Covisint documentation, 2001)

The original requirement by DC was to have one common service. This could not be realised by Covisint due to technical restrictions. Unfortunately, this

[40] This has been the accurate strategic approach in a retrospective view. When Compuware in 2004 bought the remaining rest of Covisint, only the portal solution and the messaging were part of their originally very large product portfolio.

causes a lot of trouble on the supplier side today. For example, if a supplier who worked with Daimler in Europe has his administrator in the US, this administrator cannot register the user with a DCS application. This example had been anticipated by the statement of a DC manager:

> *"During the implementation phase of designing the business process for the application integration it turned out that Covisint portal technology could not support a limited display of applications, which was a no-go for the DCS team. The US had no problem with this and DCS insisted to its opinion to proceed like in the old portal. In the end, two services – one for DCA and one for DCS – were defined which has been a sub-optimal solution because the portal idea was to have one portal for the entire DC company. I don't think that the suppliers were happy to have again two different services".*

The integration of the portal architecture into the existing IT infrastructure of DC was another significant challenge. Not only had IT departments to migrate their existing old portals to another technology, there was also the need to develop additional software to ensure communication between the old portals and Covisint.

However, during the negotiations for the portal integration, DC achieved at least a compromise. Both companies had to invest in extra programming to change parts of their architecture in order to improve the integration of the Covisint portal into the DC IT architecture. IBM helped build-up so called message handlers, allowing the transfer of synchronised/asynchronised XML-based message. These technical constraints translated into significant extra costs and efforts for all parties involved. The technical portal and application integration into the overall corporate IT landscape was accompanied by a security discussion.

6.5.2 The development and implementation of security procedures

To do business electronically, one of the key benefits of Covisint was the promised secure environment. Part of this secure infrastructure was the Single Sign-On (SSO) functionality, enabling users to access different information sources and applications with only one login and password (secure authentication).

First, IT developed several integration scenarios with alternative integration paths in order to integrate SSO functionality into existing IT infrastructure and related applications. They then checked against Covisint's offer and identified several issues. First of all, the security administration concept of DC was not covered by Covisint. Covisint only supported two different portal roles, the administrator and the user, whereas DC aimed for three different roles, the security administrator, the administrator and the user. Second, the registration module of Covisint was not supporting a 30 day password change which was required by DC. Others were related to technical problems such as that applications simply could not communicate with SSO functionality. One of the DC managers remembered:

> *"Internally, different integration concepts have been discussed where topics were balanced such as user administration concepts, user registration, SSO including user authorisation and authentication or the direct access to DC applictions".*

As a first reaction to the SSO functionality, Covisint argued that their SSO software was 'industry standard' and everything beyond that would require additional effort for them in terms of resources. DC's argument always included the underlying fact that they were not only a customer, but also shareholder of Covisint and therefore could expect some more compromising behaviour.

Among the different levels of security, the technical and organisational (and sometimes political) level was one of the most widely discussed topics during the whole GSP project. Fierce discussions took place, not only in the weekly regularly meetings but also over the phone and via emails. Security issues were raised on a technical level, related to the SSO component, and on an organisational level related to the password policies of DC and Covisint. In the end, Covisint negotiated with Netegrity, the supplier of the SSO software, to adapt their product to some of the DC requirements. Naturally, Covisint had to pay for it.

DC did not move from their security policies and then assigned IBM to realise extra functionalities which also implied additional cost and effort. Due to the complexity of the portal technology as part of a wider company architecture, and the existence of legacy systems, security concerns made it highly difficult to implement the SSO functionality within the overall IT infrastructure. However, during the negotiations, non-technical concerns were expressed by the IT manager, supported by different people from different IT departments. One of those reasons was that suppliers might have the access to critical DC information. Another one were concerns about the audit of the GSP project regularly done by the corporate auditing department. Non-compliance was punished very severely.

A good example in this context is the standard registration process. With respect to registration processes, different XML messages had to be adapted to match the relatively high security levels of DC. The discussions surrounding the change frequency of the password for the portal login highight the different notions of security. At DC, the supplier password for internal applications changed every four weeks. However, Covisint changed the password every three months. There was a huge discussion going on within DC whether or not they should give up the strict security policy at least in this area, and adopt Covisints approach. The major problem was that Corporate IT had different business units. Each of these units interpreted security differently, and no-one wanted to take responsibility for it.

Apart from technical security factors, the integration of the portal and the applications was influenced by non-technical security-related issues. Concerns about budget constraints and the question of who was responsible for the additional work were expressed by DCXnet and IT. They were translated into technical issues such as the difficulty to harmonise specially developed software for message handling with the old portal architecture, the Covisint architecture and the existing IT architecture of DC. Within this context, the integration of applications played an important role. This is described in the following section.

6.5.3 The Application integration

The integration of existing and future applications was another huge challenge within the whole integration context. Organisational and social challenges added to the technical and economic pressure of developing an overall portal integration concept. Starting to work on this integration concept, the application/migration sub-group found that there was no standard process to integrate procurement and logistics applications. In the US as well as in Germany, the respective application owners usually belonged to a business unit where the application was implemented. Most applications, though, supported only one particular procurement or logistic process. Moreover, application owners handled application integration totally different. In Germany, the IT department which ran the portal was part of the development team of an application and therefore could influence decisions in terms of functionality and future integration into a portal. In the US, an application was just created and was simply integrated into the US portal web site via a link. This meant that there was a strong need for a 'standard application integration process' to be developed to ensure that all portal requirements of Covisint as well as of DC would be met. Strongly related with the integration of applications was the question of how an application in the GSP should be requested by a supplier administrator/user. This process had to follow not only DC's security guidelines but also to take into consideration the technical feasibility of Covisint's standard process for the application request used. This aspect will be described in detail in the next chapter.

All existing applications to be integrated in a first phase were either standard software such as SAP, featuring a separate login process, or legacy systems particularly programmed to fit the needs of distinct business units in procurement and logistics that did not support web-based frames. As a result, the cost for additional programming to "web-enable" these applications had to be discussed with the different application owners. As IT budgets at that time were limited, the negotiations focused around which department had the responsibility to cover the extra costs. Additionally, the existing legacy systems inherited functionalities that were either portal functionalities or functionalities that were not in the standard portal package and therefore not available. The difficulty here was to convince the application owners to integrate their application in a first phase with a reduced functionality. In special workshops organised by the GP&S manager, the application owners got an update on the actual state of the GSP project and were involved as far as their applications were concerned. An interviewed IT manager stated that:

> *"IBM worked on different scenarios describing the integration of SAP applications and tried to support the on-going efforts with SSO. In the end, we managed to sort out, together with Netegrity, the company who provided Covisint with the SiteMinder software for authorisation and authentication, what could be done in a short term".*

As feared by some application owners, internal restructuring within DC during the project meant that the funding for additional functionality and the costs for application integration were difficult to allocate. Different cost models were negotiated until eventually some business units took over the responsibility to keep their applications updated, others did stop the communication with the portal team completely or even reported the issues to their superiors. Consequently, the GSP portal manager decided that the migration of existing applications should take place in several so-called 'migration waves'. In the first wave, applications were migrated (integrated into the GSP) if the application

owners (and their superior) were in favour for the integration and if the application fulfilled the technical requirements for a link with the GSP.
The standard process for the request and the integration of new applications, described in Figure 32, was developed in a three-day workshop in the sub-project group teams UI and content management and were implemented during the implementation phase in a step-by-step approach.

...

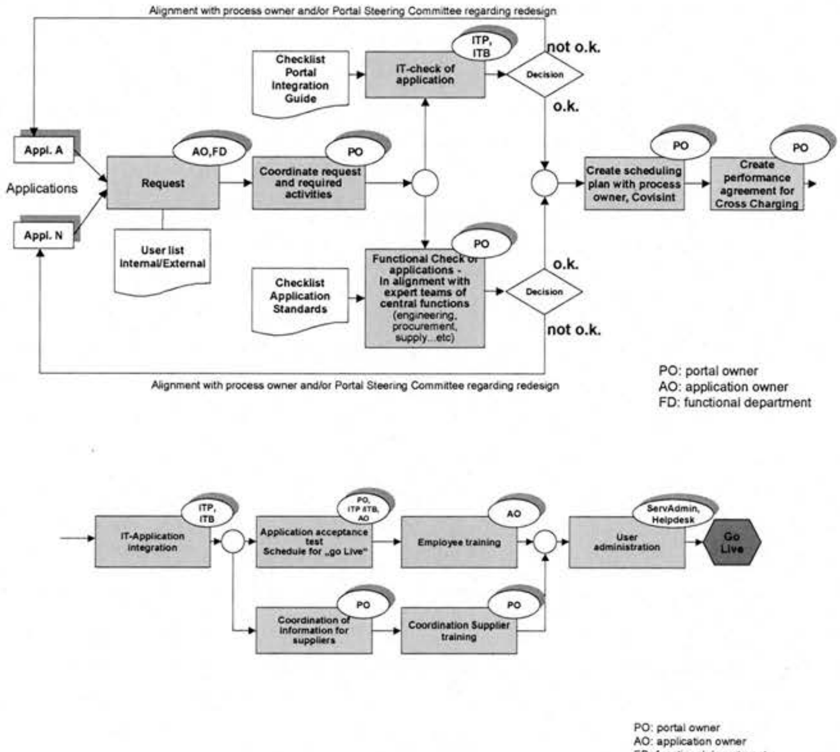

Figure 32. Process of new application integration (Internal documentation)

With the implementation of the developed standardised process of application integration, roles and responsibilities were clearly distributed among all actors who were portal owner or application owner, and the functional department. The focus was on the alignment of all different actors in the process.
The standardised application integration process was supported by a portal integration guide and a checklist for application standards to be strictly followed in order to assure transparency and consistency, while designing new applications to be in line with the GSP.

For IT, this new process meant that they had to change their entire internal process for application integration. Prior to that, the IT department had different processes in place. Also, application owners were now obliged to use this process and to follow the guidelines. Covisint could not offer a standardised process for application integration; they could only offer some very basic service that would not have suited the needs of DC. The portal integration not only consisted of the integration of existing DC portals and related applications, but also of the task to orchestrate portal security functionalities with existing legacy systems and their harmonisation with the existing corporate IT architecture. Apart from all integration activities of new and old IT infrastructure, the set-up involved the whole portal administration processes, including user registration, user migration and definition of roles and responsibilities.

6.6 Portal administration

In general, portal registration has a technical and an organisational dimension for both the supplier-user and the user. Therefore, the portal's supplier-user registration, itself part of the portal administration, was one of the most discussed deliverables that involved most of the sub-project groups during both development and implementation. One of the reasons was that the portal registration was linked to many portal functionalities. However, not only the development of the standard registration process itself but also its implementation (the migration of existing supplier-users from existing portals) and the different related challenges were important for the success and accpetance of the portal, both internally and externally, and used up many project resources.

6.6.1 Portal Registration, Portal Roles and Responsibilities

The registration of supplier-users enabling to work with OEM applications is one of the important components of a supplier portal. If portal processes are not understandable for the user, or not well mapped to the user's needs, acceptance by supplier-users and internal OEM users will be low. Therefore, one of the first activities of the registration sub-group was to look at the available standard registration processes of Covisint.

As promised in the SoW, Covisint provided a tool, called the Covisint Connection and Administration Tool (CCA), which would enable registration and delegated administration in the supplier portal. Covisint had developed two standardised business processes for portal administration and migration, based on the administrative processes delpoyed by Ford. These two different main processes included the standard registration of a supplier-user (authentication) and the standard request of a registered supplier-user for an OEM application. In the end, the standard registration processes of the CCA tool were changed to fit the needs of DCX. Depending on the corresponding service a supplier could register for, he could get access to the applications he could work with. According to some of the IT and GP&S departments, the fact that there were a number of suppliers having at least two supplier numbers remained an open issue. But this was seen as a minor problem by the DCX project manager. What happened after the GSP was operational – the consequences this had for suppliers will be described and analysed[41] in chapter 7.

Issues with respect to registration were organisational, social and technical. As IT already had some years of experience with their own portals, they were not satisfied with the standard procedures for registration of suppliers and the migration of already existing supplier-users and applications which Covisint offered. For example, in the registration case, DC pursued a much stricter security policy than Covisint. In the old portal of DC Germany, the portal roles 'security administrator', 'administrator' and 'user' were in place. The security administrator was on the OEM side, supervising all supplier administrators who in turn were responsible for their supplier-users. The Covisint portal, in contrast, only offered the portal roles 'administrator' and 'user'. A control function such as the 'security administrator' was not part of their indudstry standard portal solution. But as DC Germany insisted on the fact to further exercise a certain

[41] Exactly this issue was addressed during an interview with a tier-1 supplier because it caused him a lot of trouble and did not contribute at all to increase the acceptance of the GSP.

level of control about who would be administrator, this was an issue for some months and one major point of discussion in several meetings of the GSP sub-groups and in the steering committee. As for the old portal, if somebody from a supplier wanted to register as a supplier administrator, IT required a fax message to confirm his/her personal ID in order to be sure that the person who asked for portal access really was the person he/she pretended to be.

Initially, Covisint did not react at all to the portal role issue, and later on had severe difficulties to understand why this aspect was so important for IT Germany. As DCXnet was involved as facilitator, it became clear to them that this issue was going to be a cultural and organisational one. DC US had not half of the data security and data protection concerns of the Germans. One of the reasons was that they had worked with Internet-based applications much longer than the Germans, and the second reason was that they had no intention to control their suppliers. The view of DC US was that the more suppliers could be connected to the portal the better. Obviously, some of the IT managers had fixed personal objectives to achieve with their managers and were keen to increase the number of suppliers connected to the GSP. In terms of supplier-user portal roles, IT had given up their reluctance and accepted the two Covisint portal roles, administrator and user, even against the DC security policy. The security argument was frequently used by IT managers when there was a risk of loosing control over processes for which they believed to be responsible. Even when it was clear that only two portal roles would be available, IT managers still tried at several workshops during the implementation phase to persuade Covisint to change their preferred standard two-role-model to the DC three-role-model.

Obviously, IT's type of model was based on a lack of trust in the human administrators on the supplier side; supplier administrators first had to fax their personal ID to the DC helpdesk in order to get approval for portal access. With this procedure, IT felt more comfortable, although they only did e-business with suppliers with whom a business relationship already existed. Another issue related to trust in business relationships was the set-up and introduction of the portal Terms and Conditions (T&Cs), described in detail later in this section.

In the end, a compromise between the best-practice processes and the DC processes was worked out. This took more time than originally planned and caused additional cost for both sides due to extra programming.

The registration process should ensure secure authentication of supplier-users. Covisint claimed their process to be *the* industry standard process for portal registration. Yet, incorporating it into the DC world turned out to be a real challenge. Once a supplier-user, whether registering for the administrator or for the user role, started to register for the first time, he/she had to complete electronic forms asking not only for the company name but also for their supplier number. The supplier number is an identification number to classify supplier companies. In the CCA tool of Covisint, this number allows to link the registering person with the organisation he/she belongs to and to put the data in the right place, also necessary for data verification purposes.

Due to the merger of Daimler and Chrysler, two different supplier numbering systems still existed in parallel. As this issue occurred, DCXnet started a small feasibility study as they were well aware of the problems this would cause for portal registration. The study should find out: where those two supplier classification systems were used, if it were theoretically possible to have just one classification system for the whole DC, who should be involved, and finally, how much such a harmonisation would cost.

It emerged that a harmonisation of both systems would be beyond the GSP project, that too many systems and business managers would have to be involved, and that no-one would accept the costs related with the classification change. Consequently, another solution had to be found. In parallel, Covisint was checking the extent to which their technology could be changed to offer a workaround solution. Eventually the DC project management decided that they needed two different services, and that a supplier could decide which service he/she would like to register to (depending on the DC location he had business with). Covisint then found themselves in a position where they simply were not able to respond to their customer's needs.

With regard to registration issues Covisint suffered from a lack of expertise and experts. Only two US-based experts who were familiar with the CCA tool were working on all portal projects of Covisint. This situation did not change during implementation. Although most of the Covisint employees came from the three OEMs, there seemed to be misunderstandings and a lack of knowledge regarding the requirements concerning the implementation of the registration processes. As already mentioned in 6.5.2, different XML messages had to be adapted to match the relatively high security levels of DC. Therefore, IBM was not only involved in the conceptual and development phase of the standardised registration processes but also in the implementation phase. IBM took over most of the necessary work that should have been done by Covisint and supported, for example, the XML message exchange programming necessary to get the messages properly into and out of back-end systems. A DC manager commented this fact:

> *"With regard to registration, Covisint was not really prepared to support us in this area because they were less experienced than expected and did not fully understand our requirements. The purpose of the portal was to shift access control and user management to Covisint and to the suppliers, and to create and utilise industry standards for the process integration across enterprise boundaries. A registration interface to be reachable via the Covisint was needed. As Covisint had no experts, we all agreed to let IBM do the programming necessary to get the messages properly in our back-end systems".*

To safeguard itself, DC asked the suppliers to a sign a portal agreement (T&Cs) in the case the portal would not work, or not be available. DC intended to protect themselves in case Covisint would not be able to operate their portal service properly, and DC did not want to be responsible for possible related damages at the supplier side. The American suggestion was to have a one-pager which would pop up in the portal and would have to be ticked as acceptance. The German approach, by contrast, was to have a written document (not too long and detailed) to be sent out to the suppliers and returned signed (but this had to be linked somehow with the portal). Each approach was based on the respective commercial legal regulations of European and American trade and warranty laws.

The portal T&Cs were ready for the pilot start of the GSP. Due to cultural differences and different commercial laws, the US side opted for the "just-tick" approach. Suppliers entering the old portal for the last time should just tick the T&C acceptance field of the portal page. After having ticked and acknowledged the T&Cs, the supplier then was transferred automatically to the GSP. The European approach was totally different. An eight-page document had been created out and two copies were sent via mail to each supplier. They first had to sign and to return it before registration or migration. The T&Cs included, for example, access authorisation or duties of the administrator. But they also included statements regarding the non-availability of the Covisint-hosted GSP.

6.6.2 Migration of user data

The migration of existing user data from old DC portals was another huge challenge within the portal administration deliverable, from a technical as well as an organisational point of view. DC did not accept Covisint's quite general standardised migration process and identified several cases which had not been taken into consideration, as well as security issues which were not covered to the extent IT would have liked it. Covisint's counter argument ran along the well-known lines "this migration process reflects the industry standard". In particular, the people from IT argued against that. They wanted to be treated as a customer and stakeholder; they felt they did not get as much attention as expected. DCXnet had to jump in as facilitator and set up several workshops, in Germany and the US, in order to support the discussion between IT and Covisint to find a way of not losing still more time.

One of the big issues which was discussed quite intensively was the question of how the user data could be securely moved from the databases of DC to the Covisint database for the GSP (the portal was hosted by Covisint). Covisint proposed to just get access to the user data and put them in their own database. But this was not what IT, at least IT Germany, wanted to be done with their data. DC US took a more or less neutral position during discussions. Here, IBM was assigned to support DC in working out, once again, different technical alternatives and the related costs. These alternatives were rejected by IT with arguments that could not be understood by the project managers and DCXnet. They seemed to be quite valid and logical, but in the end no one really could say whether or not the arguments against the options given by IBM were valid. Eventually, IT got what they wanted, which was one of the alternatives worked out by IBM.
As IT promised DCXnet to share the costs that were higher than the GSP budget would have allowed, IBM started to develop the technical solution. This solution consisted of moving the user data securely from the DC database to the database of Covisint on a case-by-case basis upon a user entering the old portal. Again, XML-based message handlers were used to support these processes.

Regarding the point in time of the migration of existing users and their user data, two alternative options were worked out. The American way, a 'big bang', and the German way, i.e., being smoothly shifted when entering the old portal (for the last time). Both approaches were quite heavily discussed in the sub-project group responsible for migration. Eventually, DC US went for the 'big bang' approach where they told their registered users of the old portal to use the GSP from a certain point in time onwards. In contrast, DC Germany persisted on its viewpoint that their supplier-users would not be amused at all and decided on the smooth way.

Technically, the Covisint portal services and business processes had to be mapped onto the existing old portal and their related services and processes.

Relevant user data had to be transferred via XML messages and it had to be ensured that the right user data were transferred to the right Covisint service. During the implementation phase, it turned out that user data from both old existing portals to the GSP could not be migrated automatically to Covisint. One approach considered by the IT managers was the manual option to transfer the supplier-user data from the old portal to the new one. GP&S managers were more in favour of a solution where every existing supplier-user should register once more again in the new portal

Due to cultural reasons and a different relationship to their corresponding supply base[42], DC US decided to transfer their suppliers automatically from the old portal to the GSP as soon has they had acknowledged the T&Cs. After a defined very short period, the old portal would be shut down.

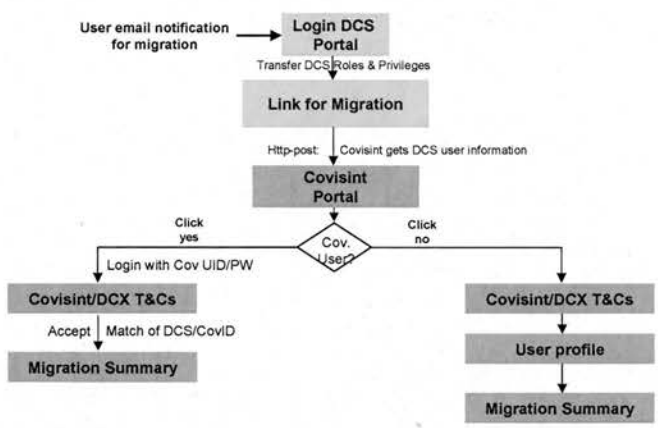

Figure 33. Implemented standardised migration process for Europe

In contrast, the European side finally decided on another way of communicating the change to their suppliers, as illustrated in Figure 33. The user of the existing old portal would receive an email with a migration link to follow and information about the new portal. This would be supported by a kind request to first register with Covisint if not already registered. In this context, one of the discussion points between the two responsible GP&S managers and one DCXnet manager was the content of the email notification to inform suppliers about the forthcoming migration event. Whereas the IT manager could not

[42] One observation included that although there was one global supplier policy handbook, obviously, supplier relationships were 'lived' differently in the daily business in US and in Europe/Germany.

understand why this was a discussion point during one of the weekly meetings, the US-based GSP project manager had no understanding at all of this issue. In the end, a supposedly adequate wording of the email notification was found, but it took more than a week. As the old portal had been fully integrated into the GSP, the user migration benefited from the additional programming and suppliers could work with their DC applications as usual.

Apart from the UI and the deliverables related to the portal integration and the set-up of the portal administration, the organisational aspect of who should be responsible in the future and lead a portal organisation as a functional department became a point of discussion. This had been started by the leaders of business units not directly involved in the GSP project, but who had indirectly been asked for their content. They wanted to get involved somehow and therefore brought the question to the portal sponsor group to think about the establishment of a functional portal organisation.

6.7 Portal governance

During the difficulties experienced in the development phase of the standard content management procedures, the sounding board asked the steering committee to assign the DCXnet manager to draft a future portal governance structure. This deliverable had not originally been taken into consideration. It turned up after the sub-project group had started to compile content for the GPS in the GP&S business units which created some concerns to which the sounding board members listen attentively. Portal content management needed to support and manage different types of content, as well as to coordinate different groups of regional and global authors.

Another reason for thinking about the portal ownership was the fact that the portal project organisation was built for only a limited time, and that the next step would be to integrate the portal team as an organisational unit either in IT or GP&S. As the sounding board was mainly a representation of GP&S business unit leaders, they pushed for a portal governance proposal and a decision until the end of the first phase of the project. From their point of view, the portal should be part of the GP&S department because the GP&S department was responsible for supplier relationships. In IT, they saw the support of procurement processes with IT, nothing more.

With the global approach of the GSP, this would change completely. The new integrated global portal would need more and other standards than the existing portal structures provided at this time. It was clear to the DCXnet manager that the implementation of an integrated portal would introduce standard processes and would require procedural changes. This could only be achieved by coordinated effort in a separate organisational structure in order to guarantee that standard processes received attention and were not disregarded and by-passed by workarounds[43]. Another reason was the management of applications that should be integrated into the portal. For example, although application development and support were primarily regional, application integration processes and procedures had to be managed globally and executed locally. And eventually, according to the IT and GP&S managers, the hosting of the portal at Covisint presented a new challenge requiring centralised management, coordination, oversight, and control.

For a Sounding board meeting in the end of July 2002, the DCXnet manager had to present a draft of the future portal governance model illustrated in Figure 34. The intention of this model reflected the global nature of the portal while including appropriate levels of both global and regional aspects. The model consisted of three major different layers: the governance layer, the portal and the application layer.

[43] This happened easily in a highly decentralised managed organisation where only some topics were monitored centrally.

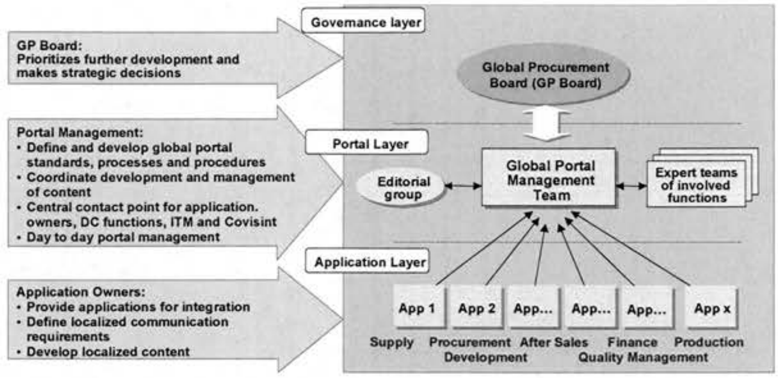

Figure 34. The implemented portal governance model (Project presentation, 2002)

On the governance layer, the Global Procurement Board (GP Board)[44] had to make strategic decisions and to set the objectives for the further development of the portal. As on the portal layer, the global portal management team represented the central node between the GP Board and the application layer, represented by application owners. Responsibilities for the portal management should include the definition and development of global portal standards, processes and procedures. Second, the portal team should coordinate the development and management of the portal content. In addition to the daily portal management, the team should constitute the central contact point for application owners, other DC functional departments, the IT departments and Covisint. The portal team should be supported by the editorial group, the GP&S communication specialists and expert teams from company business units involved.

The application layer should be represented by the different application owners who in turn would be responsible to provide ready-to-integrate applications, define localised communication requirements and develop local content. Apart from some minor remarks, and the need for future cost estimate, the sounding board accepted the portal governance model. However, the

[44] The GP Board consists of a representative of each procurement division (higher manager) plus two representatives of the IT department.

governance structure had the focus on GP&S. IT, which played an important role in terms of the operation of the portal, was totally ignored. This led to some fierce discussions between the leaders of the IT department and the DCXnet and GP&S managers. Finally, mutual consent was achieved with GP&S being the portal owner, having in place a Service Level Agreement (SLA) with the IT department which would operate the portal technically.

Today, the portal is managed by the GP&S department. But this internal working relationship is characterised by a constant battle related to budget issues and unclear responsibilities.

6.8 Conclusions

In this chapter the development and implementation of standardised business processes were portrayed. Both phases were tightly intertwined in the project. This is the reason why considerable interaction between the GSP project team and other business units (and their managers) had taken place and had led to dynamics in terms of changes of Covisint's offered 'best practice' standard processes.

The different options available were emerging through the collaboration between the main actors, the different departments of DC, Covisint and IBM, in the context of the development and implementation of the portal technology in DC's organisation. In the GSP project, those developments were patterned by the different deliverables to be produced as outcome in the project.
To develop and implement a supplier portal in a large organisation is a very complex undertaking. It is becoming increasingly complex because of the different business units involved: the procurement department which is the owner of business processes; the IT department because they were operating the IT infrastructure and ensured the integration of the portal into a corporate IT architecture and in this case, an e-business organisation which was in charge of the budget and the entire project – not to forget the external parties Covisint and IBM.

Compared to electronic auctions, the standardisation of other supplier processes was more complicated. Each of the Covisint stakeholders claimed to adopt the industry "best practice" processes. However, in reality each stakeholder wanted to develop and implement a solution that suited their needs. The statement of the former Covisint manager confirmed the situation:

> *"After the successful development and operation of auctions, in a next stage, the development of standardised procurement and engineering processes embedded in a portal environment did not gain the same momentum like auctions and turned out to be difficult and tough for everyone involved".*

Overall, the development of the standardised portal was much more complex than expected by DC. By and large, the implementation was characterised by several major aspects. IT managers had a great say compared to other project team members because they were more experienced in architectural implementation matters than all the other team members. Sometimes some of the solutions were not clear to the other team members but they had no choice and had to have confidence in what the IT department presented as solution[45]. The IT department used their expertise and knowledge to shape the portal project to their benefit. For example, during the development of the SoW, IT always emphasised their technical skills and portal experience as strengths which gave them the right to critically evaluate the content of the SoW elaborated by Covisint. In contrast, from a political point of view, DCXnet knew that they did not have the IT experience but the overall overview and the connections to the TM, as well as the budget.

Second, during the implementation phase, tensions appeared between the IT staff of the project team and the business units regarding the inclusion of

[45] Even the DCXnet manager admitted, in terms of trust, that in some cases he was not sure if everything presented by the IT department was correct or if there would not have been a better solution. On the other hand, he had no choice and had to believe them because he had a limited technical knowledge in what concerned the implementation of portals.

organisational specific functionalities into the standard. The negotiations, as well as the solutions, were triggered and approached based on budget restrictions on both sides. Therefore, the implementation of the standardised portal involved "work around solutions" to fit the users needs while at the same time observing the limitations in the budget. However, such a pragmatic approach called into question the vision about the 'best practice' solutions of Covisint.

Third, the coordination of a cross-departmental project team was a challenge. Most of the issues occurred centred around the recruitment of project staff, the integration of people into the team (different cultures, different business units and expertise and backgrounds). Each team member represented his/her business unit and had different interests and a different understanding of the facts or issues to solve.

Fourth, each of the four deliverables changed during the development and implementation phase, either for organisational reasons – as in the case of the SoW or the portal administration – or for technical reasons which had not been fully anticipated in the development phase, like for example in the case of the portal integration. Tight deadlines might also have been a reason for the frequent changes in the implementation of the standard[46]. In retrospective, in judging the overall project situation an IT manager stated:

> *"I think, we could not hold project times because the time period of specification had been simply to short. Although extended they were too short. To really have something serious, it would have taken us longer, but management was against this approach. We got pressure from management: 'You have time until April and then it must be ready.' This was definitely too short in terms of functionalities and being airtight. Another huge issue had been the understanding of processes. The*

[46] In contrast, for example, in the case of BMW, the interviewed manager mentioned that they did not change during the implementation phase from what originally had been agreed in the development phase. In addition, there was no time pressure in their portal implementation.

German side had another understanding of processes than the American side. And DC in turn another understanding than Covisint. The three parties had a different perspective on processes and this had been very difficult to come to an agreement and to work out a homogenous process. In total, for me, this had been one of the most challenging topics. Also the behaviour of Covisint, that they not really behaved in a customer-oriented way".

Fifth, the technical integration of existing applications was one of the major challenges in the project, underestimated even by the IT people. Due to the ambitious timelines chosen in the project plan, the technical integration of the portal was putting considerable pressure on the portal team. For a huge corporation such as DC, the implementation of security and corresponding procedures was/is number one on the priority list. Therefore, DC achieved their objective to ensure a greater security of Covisint registration software with additional programming of the SSO. As in the case of the password change, the discussion was even on-going when the portal went live. IT did not accept the 90 day password change of Covisint, they insisted on their 30 day change.

Interestingly, security always had to serve as the argument, particularly for IT, to stop each and every activity that would have meant a loss of control over a process (such as the discussion about how existing user data should be stored in the future). Other organisational and trust issues, such as the password change, were always discussed from a technical perspective, a level where the IT people felt familiar with and where the other project members had limited knowledge to follow and contribute adequately to a discussion.

Sixth, when the portal would shift from a project status to a more corporate function, the so-called 'portal governance model' was developed and implemented. The model consisted of three different layers: the governance layer, the portal and the application layer. In each of the different layers, the rôles and responsibilities were clearly defined in order to fit the needs of all participants, either directly involved in the portal project or indirectly involved, like, for example, the functional departments.

This deliverable was unplanned and came on the table only at the end of the development phase. During the course of the project it had turned out that some internal processes were not really existing or unclear. Furthermore, for some senior managers the portal could mean a further step in their career. Therefore, as some of them were part of the sounding board, they pushed really hard for a portal governance structure. The main 'battle' took place between the GP&S department and the IT department. Both departments claimed to have a bigger stake in this project and pretended to have more knowledge: the IT managers in terms of their IT skills and experience, the GP&S people in terms of their genuine right of the supplier relationship[47].

Finally, from a Covisint perspective, the difficulties in defining standardised business processes for supplier management stemmed from the fact that they only had piecemeal processes in place that they called 'best practice' in the industry ('industry standard'). Supplier management turned out to be more than just the auctioning process, and the corresponding processes were much more difficult to model and to map onto existing company processes. With Covisint, first three competitors had commited to work together in the long term. But in the end, the commercial auctions that delivered short term benefits had been followed pretty straightforwardly. With all other supplier management related processes, Covisint and the participating OEMs had serious difficulties in working out acceptable standard processes that suited all participants and were accepted and implemented at least by Covisint's stakeholders.

During the implementation phase, Covisint had to compromise in what was sold by them as standardised business processes – not only due to technical issues but also to the power the three OEMs were exercising. To satisfy the requirements of the stakeholders, Covisint had to invest in technlogy and effort

[47] The different GP&S departments were responsible for the supplier contracts. Only suppliers with an existing long-term relationship were asked to work with the portal.

which had not originally been planned, and which tightened the budget. IBM's role in the project was ambiguous. On the one hand, they were the strategic partner of DC on the other they had sold their Websphere product to Covisint.

The detailed description of the context, the strategy, the development and the implementation phase of the standardised portal project in the previous three chapters provided in-depth insights into the efforts to set up a so-called 'industry standard' within the automotive industry. In the next chapter, the analysis of the case study will be started with the development of a framework in order to capture the complex setting and the interactions of actors.

Chapter 7. ANALYSIS

7.1. Introduction

The goal of this chapter is to develop a framework to analyse the empirical data presented in the preceding chapter. This chapter is structured as follows. A new analytical framework is developed in the first section which is applied to the case in the empirical analysis in the following section. In the first part, the empirical analysis discusses the project, the key actors and the configurations patterned by history, context and organisational factors. The second part of the empirical analysis section discusses the dynamics occurring during the development and implementation of the standardised portal technology. The expected and unexpected outcomes of the project and their effects on the sector are examined in the final two sections.

7.2. Theoretical analysis - development of a new framework

The review of relevant existing literature offered little in terms of analytical frameworks to address and analyse the complexity of the case at hand. For methodological, practical and theoretical reasons, many socio-economic studies on standardisation have included case studies of particular platforms for negotiations about, and agreements upon, a particular standard – typically focusing on the interplay between the various interest groups such as standard setting bodies involved. These cases were typically studied in isolation from their specific context and the surrounding politics. The result had been a markedly static conception of the standardisation process. The interaction between and during the various stages of standard development and implementation, and its influence on the outcome, had been largely ignored.

Initially, ANT seemed to be a good approach to redress this theoretical and analytical limitation. Although the actor-centred perspective provided tools for exploring internal dynamics to depict the interactions between the key players of the study, it frequently had been criticised for not taking into consideration hierarchies, external effects, and for neglecting structure as well as history. To tackle the much more complex setting of the case, not only the actor-centred element of ANT had to be taken into account but also the achievement of stability of the network, the history and the context within which the network was embedded. Consequently, Jørgensen's concept of arena (1999), an account based on the extension of ANT, offered a better concept for analysis. In addition, a micro and meso level of analysis was needed to replace the 'free of hierarchical level approach' of ANT in order to capture both the focused view on technological change of a particular company and the industry context that this company operates within. Such a micro-meso view is offered by the Whipp and Clark's 'firm-in-sector' framework (1986) which was selected to provide the structural frame to study the unfolding of technological innovations along time lines and through institutionalised mechanisms of the structural repertoire of a company, including a historical, structural, and processes dimension.

The combination of these concepts – the arena of development and the firm-in-sector framework – informed the core concept used (and presented in chapter 3) to develop the new framework of analysis: a Multi-level Space of Innovation Dynamics (MSID) framework to capture the dynamics of standardised portal technology and its outcomes on two levels. Namely, at a micro level focusing on individuals and groups in the adopting organisation, and at the meso level, addressing the effects that the dynamics have in the broader context of the sector.

The idea was to develop an analytical tool to capture not only the actors in a space (that underlines the important role of locations) but also include elements such as relations, networks, artefacts and innovation activity - which allow the analysis of the dynamics in standard setting (Jørgensen & Sørensen, 1999). The objective of the framework was to identify these dynamics and to analyse how they pattern the outcome of a particular local project that was a vital part in a wider industry context. The strategy, development and implementation of standardised technology cannot be seen as separate stages or phases, but as an integrated process, affected by an underlying set of dynamics which clearly shape the final outcome. The framework developed did benefit not only from the inclusion of an actor-centred account embedded in the industry context, but also served as a flexible tool enabling a simplified presentation of the case that was essential to answer the research questions.

In regard to analysis of a multi-level space, information systems researchers have identified the benefits of approaches that enable the zooming in and out of contexts and actors to study analytical linkages between local (micro) and global (macro) (Ciborra et al., 2000).
The MSID framework addresses some of the above mentioned analytical challenges evident in existing literature. It includes the strategy, development and implementation processes in both the local and the industry context; also taking into consideration politics of change that shape the decision-making of the actors. The challenge in analysing those (standardisation) processes is to produce an adequate evolving account, which covers the complex organisational setting and the interaction between the actors in this setting. Consequently, the MSID framework gives a language to discuss contradictions, for example the global - local phenomenon.

The case study presented a unique opportunity to not only actively accompany a longitudinal and multi-spaced project but also allowed for new theory building. To analyse the different units of analysis of the case being part of different levels of the multi-layered structure, a certain type of flexibility in terms of granularity (Bowker & Star, 1999) of the analysis was indispensable (Monteiro, 2000). Granularity is understood as scope, depth and level of detail of a case. On the one hand, a detailed view of the adopting organisation within its context was necessary to understand the shaping factors of the outcome (zoom in). On the other hand, it was also indispensable to keep the bigger picture and to focus on the adopting organisations' ties with other business partners; particularly, the supply chains networking the industry and the related IT solutions supporting them electronically (zoom out). In the following both perspectives – the 'zoom in' (micro level) and the 'zoom out' (meso level) - are developed and explained.

Zoom in – the micro level of analysis

In Figure 35 the micro level perspective of analysis, the arena of portal standardisation, is illustrated in a schematic framework.

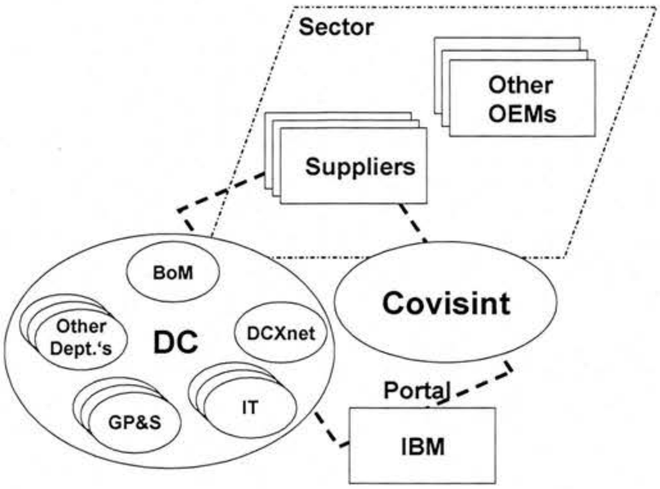

Figure 35. Schematic framework of the micro level of analysis

On the micro level of analysis, the arena of portal standardisation includes key players – active actors – and actors indirectly influencing the arena, artefacts and processes and their relations. Consequently, the standardisation arena frames the structure of the standardisation project outset on a micro level and includes other locations of development of the sector on a meso level. The creation and the entry in the standardisation arena were driven by the management of e-business innovations of the central actor (DC). As depicted in Figure 35, DC occupied several roles at the same time, as a type of central 'Meta actor' with regard to the other actors populating the arena. In parallel, within DC, the different departments such as DCXnet, IT, and GP&S, were playing active key roles. Other departments as well as the top management were also actors, but they were influencing the arena and the course of the project indirectly. Further, other actors, such as the intermediary Covisint (of which DC was a shareholder, together with Ford and GM, which were competitors), the IT vendor IBM, suppliers, other OEMs, associations and other electronic marketplaces configured the standardisation arena.

In summary, the micro level of analysis allowed the studying of the arena configuration and the course of the entire portal project from a very detailed and close perspective, without losing the relation to the overall picture and the meso level of analysis.

Zoom out – the meso level of analysis

The schematic framework in Figure 36 depicts the meso level of the multi-layered networks and supply chains supported by IT within the sector.

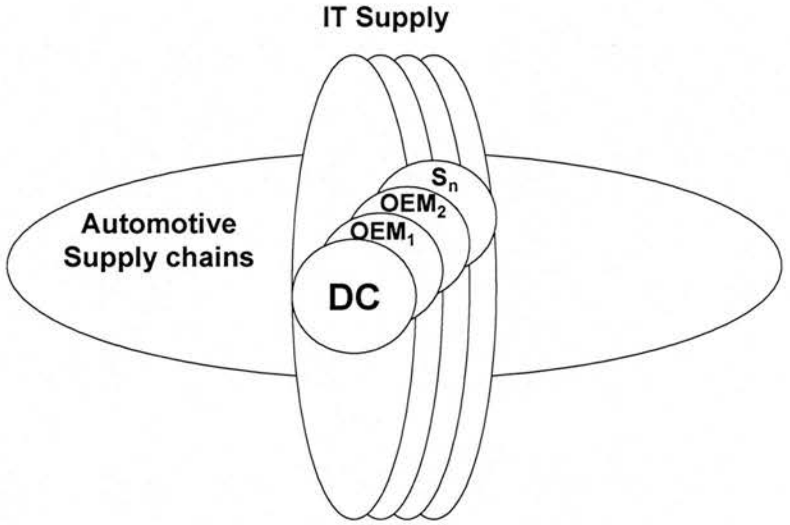

Figure 36. Schematic framework of the meso level of analysis

The framework tried to address the aspect of competition and co-operation between different actor worlds within the standardisation arena. The 'zoom out' perspective allowed the framework to address a particular project in the broader context of the industry and beyond. Whereas the micro level of analysis had only pointed to a broader perspective, this part of the model addresses the specific situation of the central actor (DC) within the arena of standardisation and its industry context

The central actor is engaged in different sorts of relations, for example in shareholding (e.g. an OEM is shareholder of an intermediary) or in strategic alliances with business partners (e.g. suppliers) or competitors (other OEMs). Those linked supply chains of key players in the sector are based on existing relationships (procurement contracts). These relations are represented through inter-organisational processes between at least two different actors. These processes, in turn, are based on supporting IT systems, i.e., inter-organisational systems and software such as portals or e-marketplaces. Consequently, the standardisation arena is populated by the actors (OEMs, suppliers) and their supply chains, competing or cooperating, linked via IT solutions. This new type of parallel competition and negotiation may lead to the construction of networks of companies and other actors trying to settle the controversy between competing technologies and standards by creating new, integrated solutions. This involves the moving between locations and the assembly of new integrated locations (Jørgensen & Sørensen, 2002). In this context, standards and standard setting play an important role. Standards enable cross-company interoperability of supply chains. Standard setting may be the decisive factor regarding success or failure in the case of competing supply chains.

The arena - a space of surprises?

Introduced in Chapter Three, the participant observer perspective and the ethnographical approach of the research had drawn the attention to a connection of the gap between plan and outcome and the difficulties in managing change with complex intra and inter-organisational systems. Seeking to develop conceptual tools to explain this phenomenon, I encountered (at a rather late stage of my study) the concept of 'drift' in the work of Ciborra et al. (2000), particularly chapter one of the volume.

As discussed in the theoretical background chapter, Ciborra et al. (2000) were studying the dynamics of corporate information infrastructures. The authors specifically addressed the phenomenon of the variance between initial goals set by management and eventual outcomes "to support a more general discourse on the dynamics of global infrastructures" (Ciborra & Hanseth, 2005: 2). To explain this process they proposed the concept of "drift". Thae concept is defined by drawing from key concepts of management literature, globalisation, strategic alignment and the economics of infrastructure and information. In their studies of organisations pursuing the implementation of corporate information infrastructure, Ciborra and Hanseth recognise "drift"as a change from the original objectives to the final outcomes. The organisations' objective in their implementation projects is to streamline an existing infrastructure through integration of different infrastructures in order to achieve a higher level of efficiency and control of a complex and expensive resource that is often critical for the organisation (ibid). In addition, existing infrastructures are frequently "embedded" in a "contextual collage" consisting of intertwined systems, processes and actors (ibid). Furthermore, the authors note that implementation often involves the alignment of diverse actors' interests and the patching and customisation of technology (ibid). Consequently, the authors argue that in such a complex organisational environment control is difficult to achieve, and that the dynamics of the interplay between the sheer complexity of technological integration, the changing business environment and the organisation itself lead to a 'drift' in outcomes (ibid).

The authors propose that 'drift' happens because of the individual and organisational limits which characterise the process of information infrastructures implementation. The implementation happens within what they call a formative context – where both the individuals and the organisation as a whole are characterised by the belief that "management is control". This belief enforces the formation of a 'vicious circle' which collides with the dynamics of an infrastructure characterised by openness and being partly out-of-control (ibid: 4). Therefore, Ciborra and Hanseth claim that the process of 'drift' occurs "often outside of anyone's influence" (ibid: 4). Consequently, the development and implementation of such IT infrastructures follows its own conformities, *"follows its own set of rules"* (ibid: 3) which may then lead to delays, unintended consequences, sudden opposition, or a doomed attempt to align all stakeholders (ibid: 7). Furthermore, in explaining the concept of "drift", Ciborra and Hanseth focus on the forces, feedbacks and self-reinforcing actions that shape the outcome. They argue that because the shaping factors are intertwined and too complex for any model to capture the dynamics, the final outcome is difficult to predict and remains open and highly dependent upon local circumstances (ibid).

Besides the introduction of Ciborra and Hanseth, the volume of Ciborra and associates (2005) incorporates a number of alternative views on the dynamics of global information infrastructures implemented within the corporate context of global companies. For example, Hanseth and Braa (2000) place the intra-organisational into the global context and claim that organisations can be characterised as 'learning, but also dynamic and unpredictable' entities (Ciborra and Hanseth, 2005: 7). In an increasingly globalised world, this leads to unpredictable and potentially massive side effects such as higher risks and less control (ibid). The authors focus on whether companies can control their global operations and whether IT infrastructure facilitates such control (Hanseth & Braa, 2005: 41). With respect to the control issue and to the argument that no-one has an influence I would argue that organisations to a certain extent exert control over their operations and infrastructures. Firstly through their organisational matrix structure globally operating in parallel with experienced functional departments. As Monteiro (2005) states, the development and implementation of an information infrastructure can be characterised as a socio-technical process of negotiation. The alignment of actors is indeed a "tortuous and fragile" process (Ciborra & Hanseth, 2005: 5) that may lead to delays and unintended consequences, but it is not completely outside the control of the actors involved. Control is obtained through the ability of the actors involved to contribute their knowledge and experience, from different areas of expertise, often forming coalitions to reinforce control, and accordingly guide drifts in a particular direction. These negotiations may, of course, provoke changes from originally planned objectives, but those drifts are not undirected. Rather, these changes can be conceptualised as a "directed" drift through the interests of the actors and the subsequent compromise.

Hanseth draws the attention to the important aspect of openness and the dilemma companies face when integrating their internal infrastructures with public ones. A pre-requisite of this type of integration is the use of standards. In the case of integrating large-scale information infrastructures Ciborra and Hanseth argue that the alignment of diverse stakeholders plays an important role, as do local circumstances. Particularly when integration is based on standards supposed to be 'best practice' leading to a tension between local (adopted) solutions versus the 'best practice' (global) solution. As local solutions are understood to provide a higher level of control, negotiations and alignment of actors lead to a drift in the implementation of global, standardised best practice solutions through compromises. It is a matter of fact (as described e.g., by Cordella and Simon (2005)) that the development and implementation of standardised infrastructure is the outcome of interaction between global design and local requirements rather than the result of a straightforward implementation of the best practice processes (ibid: 192).

One avenue of grounding the model in the "real world" of practitioners is by expanding the concept of drift proposed by Ciborra and Hanseth (2005). A more detailed (and practically grounded) concept would allow researchers to analyse the phenomenon on a much more detailed account, while offering practitioners a term they can use to manage the process of IS implementation / development. The process of drift can be characterised in terms of:

- The ***different levels of drift*** – Jørgensen and Sørensen (2002) suggest that the standardisation arena is a terrain of transformation. Those transformations are taking place on different levels closely intertwined: the intra- and inter-organisational level, the interconnectedness of intra- and inter-organisational worlds and processes.
- The ***direction of drift*** – In contrast to the portrayal of drift by Ciborra and Hanseth (2005) as being essentially random and outside anyone's influence, the analysis suggests that the direction and character of drift are shaped by certain factors: these include for example the key actors who control relationships and networks; their strategic choices and alignments, based on their insertion in the organisational nexus, the span of control, their particular perspectives rooted in their roles and experiences. Moreover to the extent that drift is directed (or shaped), it is predictable to a certain extent. It can be analysed, and actors can seek to channel the direction of drift.
- The ***circumstances*** – under which drifts occur and shape the intensity of drift, for example the complexity of a project configuration such as context and pre-project history playing a very significant role; the network of actors and their links to external actors or networks; the co-existence of competition and cooperation within the standardisation arena expressed in the parallel actions

of collaboration in alliances and the competition of supply chains; the role of IT vendors and their solution offers to support the former or the latter; the aspect of temporality, recognition of time aspects, for example external and internal time pressures.

As a result, with this it can be argued that drifts are 'directed' by the discussed different levels, the direction and the circumstances. 'Directed drifts' are occurring during an event (for example a project) and are understood as incremental or radical changes from the intended course in other directions and on different levels due to shaping factors. Those factors are based on external influences such as market requirements or on internal influences such as event-driven needs. 'Directed drifts' consist of transformations from a given status to another status, resulting in qualitative changes.

The MSID framework developed is understood as an analytical device that flexibly allows for zooming between the different analytical levels. The strip of layers from the seemingly complex socio-technical setting showed the phenomenon of 'directed drift' and the different related paradoxes patterning the outcomes. Therefore, the framework provides a language to discuss the complexity that Ciborra et al. (2000) were noticing, for example the global – local paradox.

The subsequent empirical analysis of the study is based on the MSID framework. The use of flexible granularity of the framework allowed for analysis of the complex multi-layered structure of the case by separately studying the different units of analysis. Moreover, the framework was extended by the concept of 'directed drift' to study and enhance the understanding of how dynamics of ICT innovations is patterning expected outcomes and being the source of unintended outcomes.

7.3. Empirical analysis of the case

In this section, the framework developed is applied to the case. The MSID framework allowed for an examination of the very complex socio-technical setting of the case study. The language of the framework enabled a discussion of the different emerging aspects of the large amount of empirical and information-dense data. Chapter three introduced the concept of 'arenas of development' as spaces that imply new actors, new configurations of networks, settings, re-configurations of technologies and visions involved in the process (Jørgensen and Sørensen, 1999). Here we are paralleling the analysis of Jørgensen and Sørensen (1999). The analysis of the Global Supplier Project (GSP) project has shown that the planning, development and implementation of an ICT innovation, such as the standardised portal technology, is shaped by spaces and their configuration and re-configuration, by actors and their relations, and by artefacts. The "standardisation arena" space is configured of actors included in the project and from outside, the networks of the key players, and their visions and knowledge translated into the technology. As introduced in chapter three – the methodology chapter - my participant observer status allowed me to also explore the pre-project phase which is normally excluded from socio-economical research due to the researcher's lack of prior involvement and access to information. This led to the unique opportunity to analyse the significant importance and influence of context and history on the dynamics and outcome of the planning, development and implementation of standardised technology.

Furthermore, the analysis revealed three important key findings tightly related to the research questions: the identification of the project as a vehicle for technological change, the dynamics produced by the negotiations and shaped by the configuration of the arena and the project (within and outside the project) and, eventually, the expected and unintended outcomes patterned by the dynamics and the configurations of the standardisation arena.

7.3.1 The project as vehicle for achieving change

In this subsection the 'static' elements configuring the standardisation arena, actors and their relations and networks are analysed across both levels of analysis. The actors were differing widely in their expertise, context, commitments, and perceived interests. Consequently, each of the key players as well as the more passive acting players pursued their own strategy and tactics in the following negotiations regarding the options to set up a global standardised solution that is examined in the next section.

The analytical focus on the micro and the meso level within the model helped with the formation of networks of actors, their locations and the transformations of their strategies into the standardisation arena. The project configuration on the micro level is a significant element of the broader meso level of analysis, the sector configuration. Therefore, as the initial initiative of the project was started at a key player, the project can be accounted as vehicle for change and is analysed on both analytical levels.

The description of the standardisation arena of standardised portal technology involved a number of locations. For decades, geographically, the automotive sector has operated globally and is represented throughout the world. The same is valid for IT solution providers such as IBM. However, both have very strong roots in the respective regional and local markets which are reflected in their organisational matrix-driven structure. This has important implications for the development of standardised, global IT solutions and their implementation in a socially local embedded environment (see subsection 7.3.3 and 7.3.4). Other, smaller actors, such as Covisint who are new in the market started to develop their solutions in the US. This was based on the fact that the US offers not only a vast market for ICT innovations but also facilitated technology development. Again, this had effects on the implementation of the standardised technology incorporating standardised best-practice processes in a European context. Apart from the Covisint headquarters, on a project level, the local US facility in Detroit and the various locations in Europe were important regarding the configuration of the arena and the networks of actors.

The idea to network and collaborate across different industries by implementing standardised solutions made the IT software market less stable. In addition, the big OEMs started new ventures such as the foundation of Covisint by Ford, GM and DC. Competition and cooperation reached a new level of re-definition in the automotive industry compared to the former clear cut of competitors or allies.

The sector configuration

As illustrated in the context chapter (chapter 4), the automotive sector is characterised by intense market pressures and an increasing concentration of the market. Key actors in the market are car manufacturers (OEMs), suppliers historically depending on the OEMs, automotive associations supporting the industry on a local and global level, and consultants and intermediaries such as electronic marketplaces. Although the few very large OEM organisations dominate the relationships with their suppliers (e.g. by exercising their trading power), they fight for survival as independent brands. Consequently, the foundation of Covisint by Ford, GM and DC was to take advantage of being the first mover in the market to set up an electronic marketplace and significantly shape the needed closer collaboration with suppliers and other business partners. By attracting other OEMs, the founders hoped to set a flag and introduce electronically mediated standardised processes. The transformation involved was to include software providers in the Covisint business and to cooperate with competitors in the alliance Covisint. In parallel, another important move was the push of strong brands not only of the founders of Covisint but of every OEM in order to attract and retain customers. In summary, the automotive sector followed a *strategy of expansion and differentiation*, resulting in an unsettling re-configuration of the sector, incorporating competition and cooperation within a heterogeneous standardisation arena.

The configuration of the DC arena

The configuring elements of the DC arena played a major role in respect to the GSP project configuration. DC was the central 'Meta' actor in this study where other key actors from the different departments were directly and indirectly involved in the portal project. The start of the GSP project was to transform the entire e-business history of DC. Across all business units and corporate departments, all single e-business-like supplier applications were supposed to be technically linked with the new portal. Further, the outsourcing of the development and implementation to Covisint instead of realising it in-house aimed to reduce cost and risk of IT. The standardised technology offered by Covisint was supposed to harmonise the IT architecture and the internal multifaceted processes. The standardised technology was understood to partly replace existing technology as well as to technically integrate with existing solutions via technical interfaces.

The transformation process vividly presented in the project and its configuration involved the recruitment of key actors of the IT, the GP&S and the DCXnet department. This established sophisticated project organisation included not only internal but also external actors such as Covisint and IT service providers disposing different levels of knowledge and expertise. First, the IT department that was driven by engineers with considerable technical IT expertise who had already been operating two different supplier portals; one in the US and one in Europe for two years. Second, the GP&S department was representing the business side being responsible for all supplier relations as well as for procurement and logistic processes. Finally, DCXnet assumed the role of a change agent for e-business strategies and facilitating the project. As a result, DC was changing both the network of actors and the technological-organisational vision manifested in *a strategy of resettling and inclusion.*

The configuration of the Covisint alliance

As already discussed in the context of the configuration of the automotive sector, the transformation in the automotive sector was triggered by the emergence of a new player in the market: the intermediary connecting buyers and supplier in order to collaborate or exchange information. Covisint represented the species of intermediaries based on the business model of a cooperation by the biggest competitors and supported by internet-based IT. The founders of Covisint wanted to enhance their power and started to construct an overarching network of companies and engage other actors to settle the controversy between competing technologies and standards by creating a new, integrated platform. This involved multiple locations of development and implementation of the integrated platform and the creation of a new company while staffing it with managers coming from the founding companies. Therefore, the Covisint alliance could be called *a strategy of reduction and ordering.*

The configuration of the IT vendor arena

Finally, the configuration of the IT vendor arena illustrated the power and influence of the global players in that area, for example IBM. They dominated the market with their solutions even against new players in the market such as Commerce One. The large IT vendors were not only engaged in the development of technology but also had established their presence in many locations of user organisations in supporting them with consultancy. As all large corporations across different industries were adopting their solutions, IT vendors were well aware of all benefits and downsides of either the in-house or the outsourcing option of, for example, electronic marketplaces. Therefore, technical solutions were offered in a range between completely standardised and completely adapted to user needs (legacy). In short, the large IT vendors followed *a strategy of extension of their business and of multiple engagements*.

These actors, networks, and artefacts led to the emergence of the standardisation arena and represented its configuring elements. The subsequent analysis of the case revealed that the project configuration was shaped by three factors, (1) the pre-project phase (history of past experience), (2) the market context and (3) the adaptation to corporate organisational structures.

(1) The historical perspective – the Pre-project phase

Traditional technical or corporate change case studies exhibit the shortcoming that the researchers arrived after the case was initiated (and in some cases after it had been completed) and therefore received a retrospective account of how and why the programme was initiated (McLoughlin et al., 1999: 57). A number of writers have pointed to this weakness, and argued for the need for studies to address the 'pre-project phase' though there remain very few instances that succeed in researching these (one exception being Gallacher, 2004). This partly reflects the practical exigencies of access by external researchers to a case-study company. This illustrates the importance of longitudinal studies which give access for example to the pre-project phase and how it was shaped by the prior organisational history. The researchers' involvement in DC provided an exceptional opportunity to include into an analysis the pre-history of a programme of technological change and in particular what we may call the pre-project phase.

Analysed from a historical point of view, the study unveiled the strong influence of past experiences on the subsequent course of the project. For the top management – the TM - the role of IT in general, and the Covisint portal technology in particular, was to achieve significant cost reductions concerning DC's IT infrastructure while at the same time harmonising cross-company systems and applications. Their decision to outsource the solution to Covisint was based on tactical and strategic reasons. First, outsourcing was expected to lead to economies of scale in business areas where standardised business processes could be implemented. Second, the implementation of a standardised technology was part of DC's corporate IT strategy which emphasised B2B collaboration strategy across the supply chain based on "a single point-of-entry". This was more likely to be achieved through an industry-wide initiative (e.g. collaborating with others OEMs) rather than by an isolated initiative. Consequently, the TM considered the lessons learned from the past experiences and established the change agency DCXnet in order to acquire legitimisation within the corporation and to eventually demonstrate authority and power:

- **Avoid failures** of the past; GP&S had already started an e-business programme[48] which had failed due to lack of communication and acceptance, as well as a lack of clear commitment of the top management and designated technically experienced resources.
- **Gain acceptance** of all future e-business activities within the entire corporation. Officially get the buy-in of for example from opinion leaders or critical managers who may otherwise exercise a negative influence on future projects.
- **Demonstrate** the **power** of the TM through a particular centrally managed department; nail your colours to the mast and send this message of power to other departments; in this particular case to the key players of GP&S and IT.

[48] Electronic Extended enterprise (eEE)

The second important factor that was shaping the project configuration was the contextual factor.

(2) The external contextual perspective – market considerations

As claimed by Whipp and Clark (1986), there is a relation between the development of a technological innovation and the work organisation, including not only current assumptions, knowledge and expertise but also history and context (Whipp & Clark, 1986). Therefore, project configurations involving technological innovations are tightly linked with the structures of a company, the organisational repertoire and the context within which this company is embedded. In this case, economic-technical motivations in the automotive context triggered the start of the global supplier portal. Summarised from this point of view, first of all, DC was a huge corporation which had invested heavily in an increasingly complex IT infrastructure; partly due to the historical growth of DC (see in section 4.6 of chapter 4). Additionally, the organisational structure equally favoured decentralised and centralised decisions. This led to a variety of uncoordinated business activities, not least in e-business. For example, within the GP&S, business units and central departments, in US as well as in Europe, had launched a number of single e-business activities which required consolidation[49]. By then, the Internet and e-business were out of their infancy, and serious applications holding the promise of closer collaboration and of money to be saved were on the market. Consequently, DC did what most big corporations had done late by late 1999/early 2000: in order to gain legitimisation for seriously doing e-business, a top down decision was taken by the TM and a centrally managed e-business department, DCXnet, was founded.

Secondly, within the automotive sector, DC wanted to play an active and visible role in the market with regard to e-business; not least pushed by the pressures described in section 4.3 of chapter four. As an important player well established in the automotive industry, the foundation of Covisint (by DCXnet) was a strategic step to underline the seriousness of the e-business approach. The financial investment in

[49] The reasons for a harmonisation and standardisation of IT infrastructure were manifold. Budget aspects played a role but also unclear IT architectural issues as well as complaints of globally working suppliers.

Covisint was manageable and also meant sharing the risk with other big players, GM and Ford. In addition, forming an alliance with two major competitors was a demonstration of power to the entire automotive industry; to initiate a huge industry network and to set the subsequent industry standards. The foundation of Covisint was seen as a natural step to increased efficiency in the industry through a collaborative effort that distributes risks and costs across the players, and ensures standardisation of business processes and information exchange.

(3) The intra-organisational perspective – corporate structures

Finally, the intra-organisational angle – the corporate structures as well as the intra-organisational repertoire had significantly shaped the project configuration. To gain legitimacy within DC and to capitalise on the divergent expertises and experiences regarding the GSP project, TM and DCXnet started recruiting existing competences, expertise and experience formerly gained in the individual e-business projects. The TM aimed at an equal representation of all relevant groups to be considered for two major reasons. First, to get them actively involved in the project and related activities in order ensure that any decision taken in the project was based on a consensus of all team members. These tactics should guarantee that no one defected from the decision responsibility. The decision of the TM to involve everyone in the GSP project who should be involved was translated into the phrase of "those concerned should be actively involved".

To get the full acceptance of the project within the DC organisation, which was characterised by a very high degree of business unit autonomy ('decentralisation'), the active involvement was seen as crucial for the success of this global and highly significant project. DC is a multinational corporation with a matrix structure. This organisational structure combines centralised and decentralised decision-making. Due to historical developments, the focus within DC is on brands which are represented through business units (BU). Some of the decisions related to the respective brand are thus made at the level of the individual BU. Other decisions, such as human resources or procurement and logistics, are centralised at the corporate level. This mixture between centralisation and decentralisation has led to a number of inconsistencies in decision-making. For example, each production plant that belongs to a brand (a particular BU) runs its own logistics department in order to ensure the production flow. This means that the corporate procurement and logistics department has only limited influence on the procurement at the level of the production plants that is under the responsibility of the functional procurement departments. This fact played an important role in terms of managing IT adoption, for example the replacement of EDI systems with an e-marketplace, which affected both functional and corporate procurement departments.

This rather complex socio-technical setting had driven and shaped the dynamics of decision-making during the course of the project.

7.3.2 The dynamics patterning the outcomes

The standardisation arena configured by key actors and artefacts presented in the previous section had driven a cascade of interactions related to the process of standardisation, and influenced an array of decisions during the negotiations of the standardised technology:

- The decisions in the planning/strategy phase were shaped by context and history and the pre-project phase.
- The decisions in the development and implementation phase were shaped by the project configuration (structure) and the negotiations of the key actors (action).

As suggested by Jørgensen and Sørensen (2002), the listed and related configuring elements of the arena were held together by various linkages and inter-dependencies of cooperating and competing actor networks and artefacts. As a whole, they led to a cascade of various complex decision-making processes regarding the standardised technology and were shaped to a large extent by organisational politics. A process of competition and negotiation can lead to a tenacious struggle and centres on the controversy of accepting a standardised technology as it is or adapt it to company's needs and strategies.

This research finds that the complex decision-making during the process of negotiating innovation processes is shaped by dynamics, driven by actors and their networks. On the micro level of analysis, decision-making in large organisations is the preparation of a proposal (or agenda setting) by key actors. Multilateral negotiations (bargaining) by vested interests fit the actor's interests. Personal interests may outweigh departmental interests in terms of the project goals that are to be achieved, which in turn can lead to a shift in those goals.

The project configuration analysed earlier framed the structure where the key actors translated their visions, interests, and expertise during negotiations of the standardised best practice technology. Personal participant observations during those negotiations, and the subsequent analysis of those negotiations, led to a processual understanding of the unfolding power, subtly carried out by the actors and ultimately affecting the negotiations' baseline. These negotiations were characterised for example by tensions between the key actors caused by conflicting departmental objectives on the one hand, and individual interests such as career advancement on the other.

At the micro level, the negotiations surrounding the planning, development and implementation of standardised technology evolved around the three internal active actors DCXnet, IT, GP&S, and Covisint as the external provider of the portal. Those negotiations created strong tensions between DCXnet, IT and GP&S as well as between the different departments and Covisint itself due to the varying types of power executed during the course of the project. The complex decision-making during the negotiations was strongly influenced by the alliances of power between the main actors DCXnet, IT, GP&S and Covisint. As shown in chapter 2, any negotiation process is crucially influenced by the balance of power between the participants (Lawler & Bacharach, 1987). Consequently, power is not an attribute of the actor, but of the relations between social actors (Emerson, 1962) which is approved by this research. As such, it depends on the social context that the actors operate within. According to Bijker (1995), actors use their respective type of power to limit the range of possible meanings of a technology, ideally to a definition that best serves their particular interests. In the study, the four main reasons for tensions and conflicts forming the dynamics of the portal development and implementation were all inter-related and in line with existing research.

First, the GSP project created strong tensions between DCXnet – in charge of the coordination of the project – and the IT department with respect to the development of the project plan and the objectives of the project. While the DCXnet claim of ownerships over milestones and the overall project was based on the support of the higher management within the organisation (namely the TM), DCXnet grounded their power on the hierarchical power of authority because they were not only situated close to the TM but also had control over the budget. In contrast, the claim of the IT department was based on the fact that it possessed unique IT skills and knowledge that enabled them to critically evaluate the project.

Second, the GSP project created strong tensions between the IT department - which considered itself the rightful owner of the project due to the its technical expertise in e-commerce – and the GP&S department which wanted to maintain ownership over the relationships with suppliers. Ownership over Covisint was seen as being strategically important for both departments as it would bring both new responsibilities and budget. Yet, a new organisation – DCXnet – was in charge with coordinating the project and mediating the change, as well as being the owner of the project budget. This created significant conflicts within DC as the leaders of both IT and procurement considered it unacceptable that an organisation so young should be responsible for such an important project. Procurement managers also felt that they were bypassed and feared loss of influence and power as the responsibilities for procurement application were to move to DCXnet and Covisint. IT managers understood the supplier portal as a piece of IT involving activities such as integration within the DC IT architecture and security, and hence belonging to the IT department. The creation of DCXnet was hence seen as a threat that was robbing the IT department of control over IT activities. All claims of ownership were justified since all were based on the control over key organisational resources (Emerson, 1962). DCXnet's claim was based on control over financial resources, DC IT department's claim was based on control over IT knowledge and expertise, while GP&S claim was based on control over procurement knowledge and access to suppliers. The conflicts between these different but balanced power sources translated into poor compromises resulting in significant project delays. Had the power relationship been less balanced, one actor might have taken control over the negotiations and the project might have succeeded sooner.

Third, the GSP project created tensions between the application owners (the various functional GP&S departments within the organisation) and the project team in charge of the supervision of the project. The application owners were not only losing functionalities by migrating to Covisint, but they were also supposed to cover the additional costs involved in this migration. As the project suffered significant delays in reaching its milestones, due to the many adaptations to the initially defined objectives, the Covisint project team was losing support within the organisation. The ability of these secondary actors –the functional GP&S departments - to significantly influence the outcome of the project can be explained by the weak position of the coalition formed by the principal actors – the Covisint project team – which was consumed by internal tensions and conflicts which led to time delays and compromised objectives. Without the significant power struggles between the actors involved in Covisint project team, the functional procurement departments would have had a much harder time to maintain their strong position during the negotiations.

Finally, the GSP project created significant conflicts between the project team itself and the Covisint organisation since the best practice solution offered by Covisint concerning all deliverables were contrary to the requirements and interests of the various DC actors. The standard user interface was different from GP&S existing interface, the standard portal architecture was different from the solution preferred by IT, and the standard Covisint applications offered different functionalities than those used by the functional procurement departments within DC.

Such constant conflicts between the different DC actors and Covisint have significantly delayed the adoption of the Covisint procurement solution. At the same time, significant compromises had to be made over the original objectives in order to reach consensus. These have led to disappointment in the Covisint project, and an overwhelming feeling of failure within DC. At the same time, there was little left from the best practice solution originally proposed by Covisint as each and every one of its objectives has been adapted to DC requirements. In the end, what was originally considered to be a global, industry-wide portal that would link all industry players together turned out to be a 'glocalised' - a localised global solution - version that was adapted to local needs of DC. In the next sub-section, the outcomes patterned by those dynamics are examined.

7.3.3 Expected and unexpected outcomes – the 'directed drift'

Drifts in a project are closely intertwined with the outcomes of a project and consequently may lead to surprises; that is to say unexpected, not anticipated, outcomes. According to Ciborra and Hanseth (2000), a drift happens in an uncontrollable way, cannot be anticipated before and obey their own principles. In consequence, the drift may lead to delays, unintended consequences and surprises. The open question to clarify what those principles are or, at least, in what circumstances drift, is more likely or occurs than in others.

The MSID framework is open and allows to identifying both expected and unexpected outcomes – surprises (Jørgensen & Sørensen, 2002). Surprises may appear in different shapes, one of them are paradoxes. Paradoxes occur as results of trade-offs between different active and passive actors in the negotiations and re-negotiations of the shaping of a technological innovation representing different interests restated in the negotiations, the distribution of power, the context and history, as well as of the configuration and re-configuration of the arena by those negotiations or by unexpected effects.

As shown in chapter 2, trade-offs have been studied by a number of researchers (e.g. Ciborra et al., 2000; Jacucci, 2006) in the context of the development and implementation of large-scale information infrastructures. However, those studies have not looked in detail into the exact circumstances in which paradoxes and trade-offs occur. There is evidence in this study that there is a existing link between the dynamics, the negotiations where actors decide and make choices, and the related outcomes.

Drifts are occurring during the course of a project and are understood as incremental changes from the intended course in other directions and on different levels due to shaping factors. Those factors are based on external influences such as market conditions or on a project-inherent dynamics, for example the negotiations of IT functionality. Drifts consist of transformations from a given status to another status, resulting in qualitative changes. Transferred into the project world, this concretely means, for example, gradual changes of concrete milestones, deadlines, and so on. The development of the idea of 'directed drift' has led to a more detailed account on the characterisation of this phenomenon regarding:

- The different organisational levels of drift – the standardisation arena is a terrain of transformation (Jørgensen & Sørensen, 2002); but on different levels. The transformation is taking place on both levels, the intra- and inter-organisational level. However, both levels are interconnected worlds and processes and shaped each other. For example, from an internal point of view, the complex organisational structure of DC called for a sophisticated project management that was difficult to handle for the external actors, Covisint and IBM. Covisint had limited resources and could therefore not satisfy the needs of all DC actors in the same way which led to frustrations within DC. From an inter-organisational perspective, the immature technology of Covisint limited the technical needs of DC. Consequently, within the project team, the search of a solution that fitted the needs of DC took more than time and delayed the project progress.
- The direction of drift – the drift from original goals in this project is directed by certain factors such as the strategies of the participating actors; their vested interests and organisational role. For example, by the key actors of DC

who controlled relationships and networks and shaped the direction of drift in a way that sought to ensure that their concerns and needs were addressed. Influence was not just exercised by strategic management. For example, the IT department was able to exercise influence insisting on its technical integration requirements for the portal by deploying arguments about technical security and dependability.

- The circumstances – under which drifts occur and their intensity; first, the complexity of the entire project configuration where the internal and external context and the pre-project history of DC played a very significant role. Second, the network of actors and their links to external actors or networks such as the co-existence of competition and cooperation within the standardisation arena formed, for example, in the parallel actions of collaboration in the Covisint alliance and at the same time, the competition of the diverse OEM supply chains. Third, the IT vendors and their standardised solution packages such as the Commerce One software used by Covisint, not matching the DC and Covisint needs and requiring significant customisation effort. Fourth, the aspect of temporality expressed by the recognition of time aspects, such as external pressures on the project due to a fashion at a given point of time (e.g. the e-business hype end of the 1990s); also time pressures in terms of integrating DC needs into a technical solution and meeting project deadlines.

This much more detailed account of the drift phenomenon helped to broaden the understanding of the existence and character of the paradoxes and trade-offs that underpin it, the levels on which they occur, their direction and, most importantly, the circumstances under which they are more likely than in others. The unfolding of expected and unexpected outcomes of this research consequently pointed to the analysis of shift. In this context, the dynamics in the standardisation arena also held surprises that emerged through the two major elements, the complex configuration and the complex interactions between the actors. As already suggested by Jørgensen (1999) and by Ciborra et al. (2000), the analysis of the dynamics in the project have shown a shaping of the project, and led to both expected and unexpected results.

These include, for example, a significant redistribution of the flow and control of information within the organisation. At the same time, this created new responsibilities over business processes and budget control. In their study of the dynamics of corporate infrastructures, and in contrast to the proponents of mainstream management literature who understand by 'strategic alignment' the top-down approach 'action follows strategy', the authors claimed that alignment is a long, tortuous and fragile process whereby multiple actors and resources try to influence each other to constitute a socio-technical order. Moreover, forces, feedbacks and self-reinforcing actions are at play shaping the outcome which is hard to be predicted (Ciborra & Hanseth, 2000).

The findings of the study confirm the findings of Ciborra et al. (2000) with regard to a drift created by the project dynamics as a consequence of the negotiations of the standardised technology. The distributed decision-making led to complex outcomes that were both intended and expected as well as some that were unintended and unexpected. The conflicts and power struggles over the 'Best Practice Industry Standards' observed between the different DC actors, including the Covisint organisation, had significantly led to shifts on the intra- and inter-organisational level and on the direction of the project based on the circumstances where the project was embedded.

Nevertheless, at no given point of time did the project go out of control or did the outcomes result in total chaos. For example, the difficult and long negotiations between the key players delayed the development of the portal. At the same time, in order to reach consensus, significant compromises had to be made over the original objectives. These have led to disappointment in the GSP portal project within DC concerning the standardised technology. Concurrently, there was little left from the best practice solution originally proposed by Covisint, as each and every one of its objectives had been adapted to the DC requirements. In the end, the originally perceived global, industry wide portal that would link all industry players turned out to be a 'glocalised' version that was adapted to local needs of DC. The standard user interface was different from the DC existing interface, the standard portal architecture was different from the approach of the IT department, and the standard portal applications offered different functionalities to those used by the existing application owners within DC.

Another unexpected outcome on an intra-organisational level, but that was certainly under control of the top management, was influenced by the directed shift from the control of power over IT processes and ownership executed by DC's IT department to Covisint. The IT department feared to lose control over processes, IT hardware and software, and IT security. The outsourcing of the IT processes to Covisint had driven the shift of intra-organisational control and power of resources to an external provider. Strongly related to the loss of control over technical resources is the aspect of technical integration of external software, very much related to the aspect of technical security. At DC, with its enormous complex global IT infrastructure, security was on the top of their priority list. Inter-organisational collaboration between an OEM and its suppliers was based on the assumption that both parties open up interfaces while granting the other side (limited) access to their own systems. Accordingly, the OEM as well had to abandon some control over processes; a loss of power which represented a potential source of uncertainty and insecurity.

The findings of this study support Ruppel's findings (2004) that a low level of trust in an open inter-organisational system means that the company will attempt to protect itself by introducing technical security measurements. In this case study, DC also attempted to compensate for its lack of trust in Covisint with an increased emphasis on technical security. Hence, technical security was sought to replace trust. Interestingly, security always had to serve as the argument, particularly for DC IT to stop each activity that would have meant a loss of control over a process. Other organisational and trust issues, such as the regular change of passwords, were always discussed from a technical perspective, a level where the IT department felt familiar with and where the other project members had limited knowledge to follow and adequately contribute to the discussion. In summary, the drift of control over IT processes from DC IT to Covisint led to a very complex IT architecture and was far from being the harmonised and cheaper solution envisaged at the beginning of the project.

At the technical level, the IT architecture became significantly more complex and more expensive than was originally envisaged. Technical complexities, particularly in the area of security, shaped most of the GSP. Due to the high level of security required, and due to the fact that DC IT did not trust Covisint and constructed a fall-back solution in case of a breakdown of Covisint, the harmonisation of the IT infrastructure could not be achieved. This was underpinned by organisational issues such as the maintenance of two existing supplier classification systems; an issue that after a short analysis was classified as too expensive and organisationally too difficult to accomplish. However, at a later stage this considerably contributed to the non-acceptance of the supplier portal by suppliers.

Furthermore, the re-configuration of the standardisation arena during the project led to its destabilisation, which had a huge effect on time and quality of the project outcomes. The directed re-configuration of the standardisation arena patterned the outcomes in two particular cases: the passing of the ownership of the project to GP&S, and the reintegration of the change agency DCXnet into the hierarchical organisational structure of GP&S. Both events occurred out of the blue for the project team but certainly were guided by the top management and the pursuing of their strategy. Strongly related to those events were the personal career agendas of key actors, which in turn influenced the further course of the case. These aspects will be further reflected upon in chapter eight.

Firstly, the circumstances in which the portal ownership was discussed was due to issues of content management processes and their responsibility. Various competing concerns and priorities were unresolvable. Knowledge claims and expertise were at play and the main negotiation 'battle' took place between the GP&S department and the IT department. Both departments claimed to have a bigger stake in this project and pretended to have more knowledge: the IT department in terms of their IT skills and experience, the GP&S people in terms of their ownership of the supplier relationships. The IT department still claimed to be the portal owner because a major part of the activities surrounding the portal were IT-centred; most technical integration issues were too. But GP&S only had staff with procurement skills and knowledge. Therefore, their rationale was comprehensible. Eventually, after several months of debate, mutual consent was achieved with GP&S being the portal owner, having in place a service level agreement with the IT department which operated and maintained the portal technically. Today, the portal is managed by the GP&S department in the proposed governance structure, although this internal working relationship is characterised by a constant conflict related to budget issues, ambiguous defined responsibilities, and a lack of IT expertise at GP&S.

Secondly, the reintegration of the change agency DCXnet into the hierarchical organisational structure of GP&S represented a very large re-configuration of the arena. It caused a significant – yet unexpected – drift of the outcome compared to the planning of the project start. The cascade of interactions that led to the complex decision-making was mainly driven by the DCXnet's managers' career advancement plans. Over a time period of nine months the events shaped not only the course of the project but also the individual career paths of portal team members, particularly of those who were part of DCXnet. Already the start of the new central department DCXnet and their role as change agent, and the fact that they were even located in the same building as the TM, triggered envy and rumours within DC. Unofficially, managers questioned the reputation and work of DCXnet in informal meetings or during phone calls.

DCXnet was seen as springboard for a further step on the career ladder; its managers aimed for a further step in their personal career. Projects of such size and complexity, and change agent departments such as DCXnet, in fact had the reputation of being a sort of catalyst to an individual career. DCXnet as an organisational unit had gained an excellent reputation as a broker between IT and GP&S, and as bridging the expertise gap of both of the departments. For example, due to the facilitating role of DCXnet, GP&S team members broadened their technical expertise and skills in IT, and consequently gained a better acceptance within the company.

In addition, numerous difficulties and personal changes hampered project progress. It thus became very obvious that the project would not reach a very high reputation within the corporation. Consequently, the project did not offer the prospective of boosting a personal career. At a later stage of the project, evidence for this observation was supplied by the frequent change of the portal manager; during several intervals it was even an open position that was not assigned to anyone. However, upon re-integration of DCXnet into GP&S, the project lost part of its acceptance and history started to repeat itself when GP&S and IT were again on their own in the project. It would have been helpful for all parties involved if DCXnet had continued to be in place, at least until the project had shifted from the pilot phase in the second phase. DCXnet also should have been the portal owner responsible for its management. This would have avoided the constant battle on budget issues between GP&S and IT.

The unexpected re-integration of DCXnet into the functional department GP&S harmed the project and stopped the individual career options of DCXnet managers. Due to the fact that they did not identify themselves with GP&S culture, and since they knew GP&S very well from reviews and evaluations taken, they left GP&S not long after the re-integration. Related to the break-up of DCXnet, the individuals working there experienced a decline of respect from IT and GP&S, and started to look for other jobs outside GP&S. Therefore, useful and valuable knowledge left GP&S and for the IT department it became even easier to pursue their own interests.

7.3.4 The outcomes for the key players of the sector

The outcomes of the micro level of analysis have also shaped the outcome at the meso level, particularly with respect to the key players of the portal project but also part of the sector such as IBM, Covisint and the part suppliers.

Covisint and affiliated stakeholders

The idea behind the development and implementation of Covisint – an e-commerce platform for the automotive industry – was to connect a sector via an e-market in order to improve collaboration between buyers and suppliers. Traditionally the relations between players in the same market have been based on competition. Normally, cost-benefit considerations, the enhancement of competitive position in the market and/or the improvement of organisational knowledge are the motivations to join a network. The idea was not particularly new, occurring first with the implementation of EDI networks, and had been studied widely – unfortunately often only from a technical oriented perspective (e.g. by Emmelhainz et al., 1991; Pfeiffer, 1992). One of the studies that included the 'social' aspect of networks was carried out by Graham et al. (1995). The authors suggested that the shaping of network technologies required coordination across a user community, for example to agree on business practices and standards. Further, they identified the political element of the actor coordinating those types of activities and that the network itself would have effects on the different players (Graham et al., 1995).

However, the network approach supported by standardised technology has provided new insights into collaboration between competitors within the value chain. The competitors Ford, GM and DC enrolled and aligned their interests in the Covisint alliance as standard-setting coalition because they wanted to demonstrate their power. Covisint as a business was founded by these three competitors. Although each of them was fighting very hard for market shares, they built an alliance to push forward e-business with standardised processes. This raised the question about whether there had been a trade-off related to standardisation of business processes versus the differentiation in the market. IT in general and supplier portals in particular, were not seen as differentiators in the industry. All funding OEMs were operating and maintaining vast IT architectures within their organisations.

In addition, supplier portals were seen as part of the communication tools used to improve the buyer-supplier business relationship. Apart from that, the supplier community was pretty much the same for the three big OEMs. Consequently, there was no need for differentiation and no competition between them. Thus, joining forces in standardising supply chain processes and setting a *de facto* industry standard in the sector was an objective to achieve and to demonstrate power. Although the e-market vision allowed for integration of all suppliers (their marketing slogan was "everyone with everyone"), the case has shown that still only those suppliers who already had a working relationship with DC were connected. For new suppliers, even if they were prepared to register with Covisint and to participate in the GSP, it was very difficult to get access to DC due to the fact that DC first wanted to know the supplier personally.

The IT supplier IBM

Consultants in the automotive sector offer a wide range of services. Whereas some of them only do strategic consulting, others, such as IBM, offer a complete service package around their technologies, including IT outsourcing services, or being a strategic technology partner of large corporations. Depending on their customer relationship, some consultancies shape a company's strategy to a large extent or are just a company's extended work force. As shown in subsection 7.3.1 of this chapter, in the project configuration of the standardisation arena, IT vendors followed a strategy of expansion and multiple engagements on a global basis and consequently influencing their clients. In the project, IBM adopted the role of the strategic supplier of DC and therefore forced Covisint to change the technology platform from BEA Systems to IBM Websphere technology. Therefore, IBM contributed to the dynamics aspect while shaping the negotiations of the standardised technology, particularly in the technical area. In the end this effectively meant that every participating company involved in Covisint and operating a supplier portal had to change their integration architecture for their own systems and applications. During the project, they delivered not only technology but were also active at the technical implementation level.

Consulting is a business based on a certain level of trust between the consulting company and the client (McKinsey, 2003). During the course of the project, trust issues occurred between IBM consultants and DC. For example, they were not involved in the evaluation phase of the portal options during the strategy phase. DCXnet only started to talk to IBM in a later stage of planning of the portal project. Prior to that, IBM only was allowed to contribute to some special technical questions, such as the future data base design for user management data, or alternatives for content management solutions and their evaluation. The reason for that was that IBM as strategic partner for IT already worked very closely with the IT department. Consequently, as an evidence of distrust between the project members, DCXnet feared they could share confidential information they got at DCXnet with DC IT, perhaps even deliberately.

Component suppliers

The outcomes for part suppliers were as they expected: business as usual, because the inconsistent strategy of the OEMs with respect to the implementation of the e-collaboration tools significantly affected the suppliers' negative perception of portals in general. Whereas some of the OEMs preferred the standardised industry solutions such as DC others, such as the VWGroup, voted for the in-house option. As for the supplier portal of DC, suppliers were not really involved in the decision-making. The choice of DC to act as a stakeholder of an e-marketplace, and to adopt the standardised portal technology offered by Covisint, affected suppliers at an organisational level, and at the level of the broader industry context. Consequently, those outcomes were responsible for further dynamics in the broader context of the industry.

Car component suppliers were barely included in development and implementation phase of the portal project and were not asked to give feedback until the pilot phase of the portal began. As this study has shown, some of them were not too concerned by this, while others wanted to be more included. However, using the new portal meant organisational changes for DC's suppliers. Resistance was not shown directly, but suppliers were nevertheless reluctant to embrace the new portal which was seen as 'another portal', an additional burden from a powerful OEM. For tier-1 suppliers, the GSP required them to make organisational changes in their company which would use resources in terms of time and money. For instance, one difficulty with far-reaching consequences was the supplier registration at Covisint. Suppliers had to register before they could migrate or register for the new portal. Yet procedures and the cost of this service were unclear to suppliers. Suppliers were also confused about the registration at the supplier portal which was hampered by the two different supplier registration processes for Chrysler and Daimler. Supplier users and administrators were not only concerned but also very frustrated. Overall, the GSP did not achieve the acceptance that DC had aimed for. However, the GSP at least gained attention as the portal was the trigger to bring the entire industry to one table. The reason for that was that tier-1 suppliers had to work with up to 30 different internet portals run by their various large customers. This created opaqueness on both sides and caused inconsistencies in user data management. For each portal, the tier-1 suppliers had to register separately. This led to an initiative to standardise the process of portal access. OEMs and suppliers met in order to come to an agreement to improve the portal user administration. For the benefit of everyone, a unified user data set of registration information was clear and therefore the concept of a unified user data management was worked out pragmatically and led to an industry standard in portal registration.

The technical platform change that was pushed by DC had direct implications on the supplier portals of other participants at Covisint (GM, Renault/Nissan, Ford, etc.) but has also significantly derailed the financial situation of Covisint. The GSP project seemed to be the peg to impose DC's best practice processes on Covisint rather than the other way round. Shortly after the start of Covisint, tier-1 suppliers, as well as powerful actors in the automotive arena, built up a large standard-setting coalition. Whereas Covisint was envisaged by its founders to "streamline" business processes and to enable participants to "collaborate seamlessly", this was not necessarily the perception of tier-1 suppliers. There were two reasons for this:

1. Firstly, most suppliers were excluded from the early development process. Only a few of the largest and most powerful tier-1 suppliers were involved in a limited way during a later stage of development. The decision-making remained almost entirely with the OEMs. As a result, by and large suppliers' requirements were neither part of the "Covisint vision", nor included in the development of the standardised technology. Therefore, Covisint mainly addressed the requirements of a few OEMs.

2. Secondly, suppliers already struggled with a number of such "standardised" portals, and the suppliers who had been approached at an early stage showed mixed feelings about the OEMs' approach to volume bundling and pricing.

The shortcomings of Covisint triggered the tier-1 supplier community to set up "SupplyOn," counterbalancing the OEMs' obvious power consolidation and the "Goliath" marketplace Covisint. The vision for SupplyOn was the same as for Covisint, namely to join forces, to bundle know-how, and to set up an industry wide standard platform for e-commerce. But the target audience was different. SupplyOn was marketed as an e-marketplace operated by suppliers for suppliers, expressing the underlying argument that only a supplier understands the need of the supplier community, not an OEM. Additionally, the founders of SupplyOn made it explicitly clear from the beginning that they opposed the "quick and dirty approach" of doing business, opting in contrast for an approach based on smaller but concrete step-by-step efforts and results rather than big visions which, they argued, were often impossible to implement. SupplyOn thus positioned itself in direct competition with Covisint, representing the suppliers' approach to the development of a standardised industry wide portal.

7.4 Concluding remarks

In this chapter the MSID framework and a number of specific concepts were developed to discuss, analyse and eventually present in a simplified way the very complex socio-technical setting of the empirical case study. First, the framework was applied to the project configuration and identified the areas shaping it from the beginning. The final DC portal strategy appeared to be largely patterned by its history, which we traced from the pre-project phase, and the context within which the portal was embedded. Hence, the decision based on corporate history and context to 'outsource' the supplier portal to Covisint subsequently shaped the whole project and led to a dynamics and additional influencing factors. For example, the lock-in of existing practices and technologies at DC and the diverse strategies of the key actors negotiating the 'Best practice industry processes'. Negotiations and the distributed decision-making were influenced by interpretations and transformations of ideas, visions and interests on departmental and individual levels. This led to a shift of the project goals and had both expected and unexpected effects on the outcomes for all actors of the standardisation arena.

This chapter has developed and applied a theoretical framework to explain the dynamics of standard development and implementation. The application of the framework to a specific case study – the development of Covisint in the automotive industry – has allowed the researcher to explain the way concepts can be applied to understand complex information systems dynamics via empirical research. The theoretical and practical implications that accrued from this analysis are explored in the next and final chapter.

Chapter 8. CONCLUSIONS

8.1 Introduction

This thesis has examined the socio-technical dynamics and outcomes of an ICT innovation, a standardised portal technology. The complex socio-technical setting of the empirical case represented a highly challenging analytical endeavour. The analysis drew upon Jørgensen's arena concept (1999) and Whipp and Clark's firm-in-sector framework (1986) to develop a new framework to explicate the influence of the socio-technical setting over the life cycle of standardised portal technology as well as the Social Shaping of Technology (SST) perspective. The model attempts to expand the understanding of the socio-technical dynamics which pattern both the decision- making processes and the outcomes of complex ICT innovation projects. The thesis has a number of important findings that are both theoretical and empirical and concern the nature of ICT innovation dynamics in the context of a complex multi-spaced setting.

The major challenge in analysing the portal standardisation process was to produce an account which included interaction between the actors in the particular setting. The model that was developed assisted by enabling an actor-centred account embedded in the industry context, and also served as a flexible tool to simplify the presentation of the case and to answer the research questions.

The research presented in this thesis sought to answer the three research questions proposed in the introduction:

- What are the factors that shape the emergence of an inter-organisational portal strategy?
- What causes the dynamics in developing and implementing a standardised supplier portal?
- How do these dynamics pattern the outcomes? How does local change take part in the wider context of the sector?

The study proposed that the organisational politics of decision-making processes between the actors involved in standardised portal development and implementations patterned the dynamics and the subsequent outcomes of the standardisation process. To support this argument a single case study of the development and implementation of standardised portal technology in the automotive industry was presented. The study highlighted the role that misunderstandings, the pursuing of various interests, the conflict and power struggles between the actors play in shaping their actions, and ultimately the outcomes of standardisation process. The analysis showed that the unfolding outcomes are shaped by the dynamics taking place in the distinct phases before and during the project. These dynamics explain the trade-offs and the partial failure of the portal standardisation process both to achieve an industry-wide standard and to benefit the companies involved.

The aim of this final chapter is to present the implications of the findings for practice and theory. The chapter will proceed as follows. The next section will discuss the contribution of the analytical model developed to theory. In the subsequent section, the dynamics in portal standardisation is reflected upon in the light of the theories that were used and consists of a discussion about configurations and the management of expertise. Subsequently, the complex trade-offs of the project, including the global versus the local aspect of a global solution and the role of 'best practice industry processes' are discussed, followed by a short reflection on actor's individual career advancement through projects and their effects. The limitations of the study which arise mostly from the research design as well as the areas for further research are identified are then discussed. Finally, implications for practice drawn from the case and some closing remarks conclude this chapter.

8.2 Findings and contribution to knowledge

The findings of this thesis have both theoretical and practical implications. The next sections present the theoretical and practical implications of each of the three research questions.

8.2.1 Theoretical contribution – the MSID framework of analysis

The analysis of the dynamics of the standard lifecycle and the complex socio-technical setting presented in the previous chapters required to develop a framework – the Multi-level Space of Innovation Dynamics (MSID) framework.
However, an analytical framework has to fulfil a number of criteria due to the fact that dynamism and complexity of standardisation set specific challenges for theory building. According to Fomin et al. (2003) these criteria should address the openness of the framework and its ability to capture the essential features of the standardisation process and its outcomes. Also, the concepts used within the framework should take into consideration the standardisation agreements related to technical artefacts, the involvement of multiple activities (including decision-making and technical construction). Furthermore, a framework should include the change of the standardisation process over time and space and across a set of diverse actors who do not necessarily share the same interests (Fomin et al., 2003). In the following subsection, I will therefore reflect on these criteria, an analytical tool has to fulfil, and the degree to which they were included in the analytical framework developed in this thesis.

A number of different analytical frameworks have been used in the standardisation literature to address the development and, less often, the implementation and use of standards (e.g. David & Steinmueller, 1994; Schmidt & Werle, 1998; etc). However, as previously discussed in the methodology and in the analysis chapter, most of these frameworks employ a static perspective and address the development process in isolation from the context of standards use. The challenge in analysing the standardisation process is to produce an adequate evolving account of the complex dynamics surrounding the standards; an account which includes the standard planning, development and implementation. In addition, most of the existing frameworks offer a rather narrow and restricted account which did not match the complex socio-technical setting of the study and therefore called for the development of a new framework. Consequently, the development of a new analytical tool combining the strengths of different existing frameworks was the approach to cope with the above mentioned challenges.

The new model developed, illustrated in Figure 37 and Figure 38 was already described in the analysis chapter (section 7.1)

'Zoom in' – The micro level of analysis

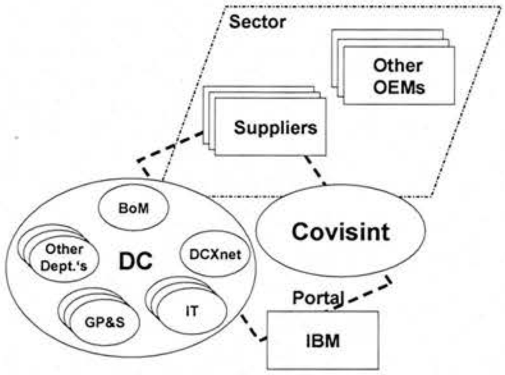

Figure 37. The micro level of analysis of the framework developed

'Zoom out' – The meso level of analysis

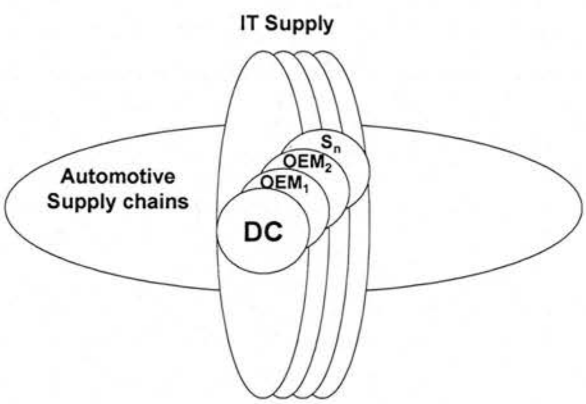

Figure 38. The meso level of analysis of the framework developed

The MSID framework draws upon Jørgensen's (1999) concept of "development arena", the firm-in-sector framework of Whipp and Clark (1986) and the concept of drift of Ciborra et al. (2000). Fomin et al's (2003) criteria list mentioned above was useful as it enables the researcher to check whether the developed model fulfils the criteria for theory-building to tackle the dynamic aspect in a standard lifecycle.

The new model developed in this thesis serves as an analytical device to support and extend the understanding of the course of events that take place in a complex socio-technical setting during the entire standard lifecycle. The novelty herein consists of the interlinkages between structure and action and a micro and meso level of analysis. These interlinkages represent the principal strength of the model. Mapped to the list of criteria enumerated by Fomin et al. (2003), another strength of the framework is that it benefits from the application of the notion of "development arena" to explain the evolution of standards as a result of competition and co-operation between different networks of actors (Jørgensen & Sørensen, 2002). This concept fulfils simultaneously most of the criteria, for example openness or different levels of analysis.

Mirrored with the requirements for theory-building, the arena concept is characterised by openness and is able to take all necessary aspects into consideration; it encompasses not only the whole standardisation process taking place in one space but allows for different spaces and configurations as well as diverse actors pursuing divergent interests, visions and knowledge. Additionally, the concept addresses the evolution and change of a standard throughout the entire lifecycle shaped by configurations which can be re-configured as well as influenced by decision makings of the actors patterning the outcomes. To apply the concept of Jørgensen (1999) is useful because it spans an innovation space holding together the settings and relations that comprise the context for product or process development. However, the concept can be criticised for two aspects. First, there is an uncertainty in terms of the correct level of analysis if there are a number of different development spaces of innovation at the same time. Therefore, the identification of the innovation space depends on the time the research is done. Furthermore, to include the entire life cycle of a standard may change the biography of the standard because different sorts of actors in different spaces shape the decision making in terms of the choices concerning the implementation of the standard (for example, whether and how it is implemented). These choices might in turn decide if a standard takes up or not. Decision-making during the implementation phase can be far removed from the standard setting context (Voß et al., 2002). The actors involved may not see themselves as acting in relation to standards systems insofar as these aspects may be ancillary to their main concern to build systems (and may indeed be bundled up inside the choice of particular artefacts and systems). As a result, it was important to develop a language that can more effectively capture the multi-level analysis needed to do justice to a dynamic analysis of standards.

In addition, I would like to add to the 'list of requirements' for theory building the 'flexible granularity' in order to enhance the perspective of analysis. The concept of granularity has been applied to standardisation and classification by Bowker and Star (1999), who note that classifications need to allow for change and permeability on different levels of granularity, but also can impose restrictions (Bowker & Star, 1999). Flexible granularity can be explained as giving the framework an appropriate level of granularity to create a language analysing the information of the case. Events driven by the dynamics on the micro level, such as in a project on company level, have effects on the industry community on the meso level. This in turn affects events on the sector/meso level, such as directives worked out by associations influence supplier organisations on the micro level. Consequently, the flexibility to zoom in and zoom out on a micro and meso level allows for a better understanding of complex configurations and interactions and therefore increases the degree to identify issues on both levels.

The flexibility in the granularity of analysis is indispensable in the exploration of the case. Applied to the planning, development and implementation of standardised technology, it is thus understood to facilitate the analysis of the micro phenomenon (e.g. patterns of local requirements of the standard) and the macro phenomenon (e.g. a standard as cutting across inter-organisational contexts within on a wider scale of the sector or even on a global scale).

'Zoom in' and 'zoom out' on both of the levels enabled the researcher to flexibly focus either on a particular event or a chain of events on the micro level or on the meso level to identify and follow the dynamics and the subsequent outcomes.

Furthermore, the new criterion of mapping the 'global-local' argument and the two-way direction of dynamics had brought in the 'firm-in-sector' perspective of Whipp and Clark (1986). In their study, they analysed the process of innovation in the automotive industry from a product, process and work organisation perspective. Their research found that an organisation disposes of an 'organisational repertoire' consisting of company-specific knowledge to coordinate everyday activities, activities associated with change and activities undertaken in response to special situations such as the development and implementation of a new standard. Depending on the standard, the organisation will adopt differing 'poses'. The adoption of a new standard may transform the existing basic operational pose of the repertoire. However, change in the repertoire through a new standard is linked to a certain degree of uncertainty. The new standard may be compromised due to resistance, or be problematic because of the absence of necessary technical knowledge or expertise.

This, in turn, might shape not only the outcomes but also points to the fact that some configurations and re-configurations in the standardisation arena are more likely to happen than others. Configurations in this context might not be compared to large scale technical systems in which elements are tightly coupled and where the coupling is imperfect and contradictory (Russell & Williams, 2002). The company-specific repertoire includes a mixture of organisational and technical expertise and knowledge gained in former projects. In addition, the context in which a company is embedded influences and drives the actors and their decision-making. As a consequence, the decisions taken pattern the outcomes, and might differ from the desired outcomes envisaged at the beginning of the process.

The exploration of the dynamics of standard setting – including a global and local perspective – enabled the discovery of a drift between the expected and unexpected outcomes. The increasing network of single organisations supported by global IT infrastructures has stimulated research on the dynamics of large information infrastructures, as Ciborra et al. (2000) have shown, for example. A number of researchers have looked on the complex process of linking large-scale information infrastructures of single organisations within a global web characterised by externalities and interdependencies. In context with this research, most notably with regard to an increasing globalisation and strategic alignment of actors, the idea of drift, formulated in the dialectics between local moves and macro outcomes (Ciborra & Hanseth, 2000) has been enhanced by this study. In looking in detail at the nature of drift, its different levels, its direction and the circumstances in which drifts occur we are able to get a better understanding of the phenomenon and the related paradoxes.

The MSID framework developed in this thesis allowed us to incorporate paradoxes, which are the results of trade-offs, as the framework attempted to explain the circumstances shaping the dynamics of standardised technology on a micro level. Those circumstances may lead subsequently to a directed drift in the outcomes on both of the analytical levels. Moreover, the framework explained the importance of recognising history of pre-project phases and contextual aspects. This is important because both pre-project phases and the context of the standardisation project guided the actors in their decision-making choices which subsequently pattern the outcomes of the standardisation project process.

In the next subsection, the key findings of the study are reflected upon in relation to the theories used in the framework developed.

8.2.2 The organisational politics of decision-making processes

The previous subsection laid out the theoretical argumentation justifying a new theoretical framework to present the standardisation arena and to understand the dynamics within the different phases of the life cycle of standardised technology. Within the study, the dynamics issue of standardised technology was addressed, particularly with a focus on the entire life cycle including planning, development and implementation. The discussion in chapter two has shown that existing research on standardisation has largely ignored both a life cycle-based approach on standard-setting as well as the integration of the dynamics aspect in and between the various stages in a standard life time. The developed theoretical framework captured the complex socio-technical setting and combined both the structure and the interaction in order to identify the unfolding of organisational politics of decision-making related to socio-technical processes.

The findings in the analysis chapter (section 7.3.1) answered the first research question concerning the factors that shape the emergence of an inter-organisational portal strategy. The study revealed that besides the historical factor (the pre-project stage) and the context factor (external and internal), the configuration of the standardisation arena is a significant factor in shaping an inter-organisational portal strategy. Therefore, in the subsequent subsection, the role of configurations as an element of the MSID framework is reflected upon.

The role of configurations (structure)

In Chapter Two, different studies focusing on the aspect of structure as element of organisations have been presented with regard to change and innovations (e.g. Staunton & Clark, 1989; Edwards, 2000). The concept of structure highlights the stable aspects of company organisations incorporating individuals that learn a collective repertoire of cognitions, normative frameworks and behavioural patterns (Clark & Staunton, 1989). Therefore, organisational structures pattern and influence innovation processes depending on the configuration of actors and artefacts. As the standardisation process in the study occurred at the intersection of structures of signification, legitimacy and domination, and was embedded in the network and social relations within and across organisations, it was necessary to examine the configuration aspect of the elements which patterned the process.

The analysis of the GSP project has shown that, as suggested by Jørgensen and Sørensen (1999), the planning, development and implementation of an ICT innovation such as the standardised portal technology, is part of an innovation space. Within this innovation space, a configuration and re-configuration of actors, their relations, networks and artefacts occurs. The 'standardisation arena' space in this study includes actors within and outside the standardisation arena, the different networks of key players, and their visions and knowledge which are translated into the standardised portal technology. Jorgensen's concept of the "development arena" idea has been useful in this respect as it highlights the complexity of the spaces in which standards development and implementation processes are worked out, and the possibility that developments will set off radical re-configurations of the relationships between players and of the overall arena itself.

However, the "arena" concept, though offering a step forwards from more simplified conceptualisations of the spaces where actors interact (as for example in early ANT analysis), does not wholly resolve the conceptual and epistemological issues that such actor-centred explanations face (see chapters two and seven). The arena concept is therefore limited in its analytical level. To overcome these shortcomings, the framework developed here has been enhanced by including two levels of analysis to explain the innovation space.

The MSID framework that I have applied to the case suggested different alternative configurations of actors and relations. The micro level of analysis represents the project level of the study and points to a variety of conceivably alternative project configurations in the standardisation arena. For example, the inclusion of selected actors or network present in the standardisation arena; or, a configuration where some players are only included for special tasks and excluded for others. The former may well delay project timelines, whereas the latter is difficult to implement in practice. In addition, the aspect of temporality also shapes configurations. A particular configuration first may pay more attention to what temporary contingencies and later (through re-configuration) may focus on a long-term structural change.

The findings of the study, however, indicate that some configurations are more likely to happen than others. More specifically, the project configuration as it was set-up in the project was largely patterned by the three factors of pre-project phase and the external (market) and internal (organisational structure) context. In general, projects are drivers of change and their initiation reflects the goals that the project sets to achieve. The global supplier portal project was not a conventional project but a Meta project consisting of different sub-projects. Consequently, the sophisticated project configuration was beyond usual project set-ups and mirrored not only the complex organisational structure of DC but also had to consider the structures of Covisint. The project configuration that I have studied reflected the experiences of previous projects made in the pre-project phase.

The temporality aspect seemed to play an important role. History and context-based experience of internal key actors were configured with external actors in order to get a solution for business and technical requirements on a short-term basis. This combination, however, was the first action to meet deadlines exposed by the top management. In a long-term perspective, external actors would be excluded after certain objectives were reached and the standardisation arena was re-configured. The top management intended to profit from lessons learnt in avoiding failures and to gain the legitimacy that was important for the project's success. One step was to include all key players and to 'be' key players to capitalise from their expertise and know-how, and to get their commitment to the project to make it a success. Additionally, top managers were aware of the fact that the global supplier portal project was a strategic project because, for the first time, an IT project of this dimension has been outsourced to a third party. Top management expected considerable resistance from some of the key players. Their resistance to the project was explained based on their fears of losing power and control as the outsourcing of the project, which meant that they were losing ownership over critical resources. Their discourse, however, was expressed in terms of technical expertise rather than in terms of their desires to maintain control over resources (which is reflected upon in the next subsection of the role of power and management of expertise).

Nevertheless, applying the enhanced analytical framework allowing for a flexible zoom in and zoom out on both levels, some difficulties were encountered during the analysis. As with the 'development arena' concept of Jørgensen (1999), it still remained unclear whether the nexus of standards development to be analysed is Covisint (that originally was supposed to deliver standardised best practice processes) or DC; equally is there a single development arena or are there multiple parallel histories of development. The solutions presented by Covisint were far away from being mature and did undergo significant changes during the course of the project. For example, the portal registration process was adapted to the requirements of DC, although the original version developed successfully by Covisint began to be implemented by other participating OEMs. Another example appeared to reverse the nexus of development from DC to Covisint. The technical platform change driven by DC underlining their interests in security forced Covisint to re-develop some of their original offered best practice procurement processes. Thus, a quasi-standard software platform developed by DC led to a re-configuration of the nexus of development. In addition, due to the fact that development and implementation of the standardised technology was blurred, it seemed that multiple centres were shaping the arena. The supposed to be industry standard developed by Covisint was adapted to DC needs by the programming of IBM. Therefore, analytically it was difficult to detect where development ended and implementation started and what really is understood in the term 'best practice'.

The discussion in the next subsection reflects on the role that the power and expertise of the key players has played in shaping project configuration.

The role of power and expertise of key actors

Apart from the configurations in the standardisation arena, the analytical framework enabled the identification of the interaction of key players in translating their visions and knowledge into artefacts. Herein, power and expertise turned out to play a significant role in the study. Power and expertise were found to be critical variables that shaped the decisions made by actors, thereby explaining the reasons why some decisions became more likely and important than others, and also explaining why some other decisions are never taken. Their role is discussed in the following paragraphs.

As the study revealed, DC as an organisation acted as kind of a 'Meta actor' and the participant departments such as DCXnet, GP&S and IT were the key actors shaping the decision-making during the course of the project. The micro level of analysis allowed for a processual understanding of the unfolding power in decision-making processes during the negotiations of the standardised technology. As analysed in the previous chapter, these negotiations were characterised by tensions between the key actors caused by conflicting departmental objectives, such as power over resources or technical expertise on the one hand and individual interests such as career advancements on the other.

At this point, on a micro level of analysis that seeks to understand the behaviour of key players during the negotiations, it is useful to examine the job position of key actors within the organisation. Closely linked with the aspect of a particular job position is individual expertise or the expertise of a group of individuals (e.g. technical experts), which is related to that the power of that individual or group. According to the project configuration reflected upon in the previous paragraphs, the project team included a balanced mix of actors with technical and non-technical skills and expertise. Due to the lessons learnt in the pre-project phase, the management of skills and expertise indicated the professionalism of the TM: the key actors included IT with significant technical expertise, the GP&S department with the procurement know-how and the DCXnet – which coordinated the project as change agent on behalf of the TM and had significant expertise in change management and e-business implementation. However, as described in chapter 7, during the negotiations and the decision-making of the best practice processes strong tensions occurred between the key actors, due to technical issues.

As discussed in chapter two, researchers have found that knowledge, power and politics play a very significant role during the process of innovation. For example, Hislop et al. (2000) revealed how hierarchical power and politics shaped a wide range of issues such as the scope of change, issues of agenda formation, type of people involved in (and excluded from) the decision-making processes, the value that was attached to particular bodies of knowledge, and the way meaning was managed to justify the decisions made and therefore the whole pattern of the process of innovation (Hislop et al., 2000). In the same line of argument Fleck and Tierney (1991) claimed the concept of technical expertise and its management in terms of power and knowledge: expertise is situated and embodied, continually renegotiated amongst social groups (Fleck & Tierney, 1991).

In exactly this context, the research findings suggest that different sorts of power patterned the course of the project and were identified as key factors of the dynamics. Although the IT department was the most experienced department from a technical (power of expertise and knowledge) point of view, the TM (power of authority) pulled the strings within Covisint (via DCXnet) and provided DCXnet with the budget (economic power) as well as with the official leadership of the project (transferred hierarchical power from the TM). Further, most of the issues were of a technical nature, which explains the large degree of involvement of the IT department as well as the number of tensions during the negotiations based on a multiplicity of power sources. IT could therefore not use its large technical expertise to increase its power.

The efforts of IT to use its technical expertise to maintain its power have failed. In the end the vision of TM to outsource the project succeeded, despite the opposition of the IT department – although the exact shape of the project was not as TM originally intended. The decision to outsource the portal to Covisint weakened the position of the IT department. Outsourcing of IT meant that systems appeared to be developed by a third party. The role of the IT department within an organisation had changed from designer to implementer. Especially after 2000, the significant reduction in the IT budgets coupled with the trend towards IT outsourcing led to significant erosion in the power held by IT departments both in terms of lower financial resources and lower responsibilities and control of IT development and design activities. The DC IT department was the owner of the entire IT architecture, technical security, solutions (software and hardware), related budget and manpower. For them outsourcing meant a re-distribution of power over processes, solutions and resources to Covisint. Consequently, outsourcing weakened their power position within DC. Technical knowledge and expertise no longer counted as an asset for the IT departments and the effects of that were reflected back in the outcomes. The industry-wide e-commerce platform Covisint was supposed not only to manage procurement and supplier relationships, but it also replaced company specific IT systems. As such, the introduction of Covisint led to changes in the distribution of power between the different departments within the organisation such as the procurement and the IT department. These changes in intra-organisational power relationships ultimately explain not only the tensions during the negotiations, but also the shifts in expected outcomes and the occurrence of unexpected ones.

In the next section we discuss the extent to which the organisational politics and the decision-making embedded between standardisation arena configurations and the power and expertise of key players patterned the outcomes of the study.

8.2.3 The complex trade-offs of the study

Intermediary results – contradictory outcomes

The study revealed some interesting findings in the attempt to answer the last two research questions (which address the aspect of how dynamics pattern the outcomes and how local change takes place within the broader context of the sector). In applying the model to the empirical case, the research was confronted with paradoxical and contradictory outcomes related, in the first instance, to the micro level of analysis – the portal project and the deliverables. As shown in chapter two, paradoxes have already been studied in the context of the implementation of global large-scale infrastructures, for example by Ciborra et al. (2000). Williams (1997) had also explored the tensions and contradictions in the mutual shaping of technology and work organisation linked with universal solutions and local contingencies.

A closer inspection of these contradictions showed the existence of trade-offs between the original project objectives and the outcomes and enabled the research to uncover the circumstances in which they occurred. It seems that there is a link between the dynamics driven by the shifts, the trade-offs and the final outcomes. The trade-offs were caused primarily for two reasons: first, by a number of competing concerns about portal functionalities on an organisational and on an individual level and, second, by the interconnectedness of an intra- and inter-organisational world, incorporating collaboration and competition and a mixture of both. Those complex trade-offs patterned the outcomes or were at least providing surprises (as, for example, in the case of the organisational re-integration of DCXnet in the GP&S department). Thus, apart from the paradox observed of one nexus as centre of standardised technology development versus multiple histories discussed in the previous subsection, the following reflections focus on the global – local and intra - inter-organisational paradox as a result of globalisation.

Globalisation is characterised by expanding markets, global acting companies and cross-boarder investment and technology transfer. This raises questions about where it comes from and what the dialectics are between local moves and macro outcomes (Ciborra et al., 2000). In studying the dynamics of corporate information infrastructures, the authors unveiled unintended "management games" that govern the adoption of infrastructures in large bureaucratic corporations as well as "the assessment of the role technology played in reinforcing existing power structures" (ibid: 1). The authors suggested that the complex process of IT networking in an organisation cannot be understood by applying traditional approaches for mechanical companies because IT is highly configurational and bureaucracies are also decomposed in hierarchical layers. Corporate IT architectures are embedded in larger "contextual puzzles" where patching and alignment of heterogeneous actors, and "bricolage" were used frequently regardless of management strategies (Ciborra & Hanseth, 2000).

The management strategy aspect is exactly the point where I want to take up the discussion to bring in another perspective and reflect upon the strategic choice of an organisation: the adoption of a global solution which inherently is built upon standards while in parallel, to collaborate with its competitors in order to develop and implement further this global solution in the standardisation arena.

The role of strategy – the choice of standardised technology

The answer to the first research question had revealed the factors leading to the emergence of an inter-organisational strategy. One of the roots of the contradictory outcomes identified can be found in company strategies, both at a corporate and at a departmental level. The findings indicated a strong importance of the pre-project phase, context and history and were discussed in the section above. These findings are strongly related to the contradictory aspects and tensions discussed here.

Before ICT gradually emerged in organisations, the business world provided two alternative options for companies regarding managing the relationship with their business partners: either to develop tight, collaborative relationships with a buyer / supplier organisation or engaging in competing, arm's length relationships with another organisation.

In the automotive industry, the OEMs-supplier relationships were historically characterised by significant power imbalances against suppliers. For example, the adoption of EDI in the automotive industry was in general forced by OEMs on their dependent suppliers (Ratnasingam, 2000; Webster, J., 1995). However, since the late 1990s, relationships in the automotive industry were reshaped by tremendous technological changes and by enormous market pressures (McKinsey, 2003). Tighter collaboration between OEMs and suppliers were replacing the traditional arm's length relationship. There were two major drivers behind the Covisint vision. First, each OEM had an extensive network of suppliers. They, in turn, frequently supplied more than one OEM. In this situation, bi-lateral standardisation of the complex processes and technology that enable the co-operation both between OEMs and suppliers and between different suppliers is less than effective, as it would leave suppliers with the need to maintain one system per OEM.

The buy-in of DC in the vision of Covisint as an e-marketplace that aimed to set a *de facto* standard with best practice industry processes seemed very attractive. For several reasons it was a strategic option of DC to be a shareholder of Covisint. First, it represented a financial engagement (along with other financial participations in Internet companies) which could pay back high interest rates and represented a very strong commitment in this affair. Second, it was a demonstration of power for the entire automotive industry to build an alliance with two major competitors; in a sense to indicate directions. In line with the corporate strategy of being a technology leader, DC wanted to demonstrate that it had understood the innovation signals of the Internet and its technologies. DC found itself in the same situation as the other OEMs in terms of improving the supplier relationship and cutting down cost, so why not an alliance and join forces with competitors? Third, when Covisint as an idea emerged, the promise of Internet technologies was to help DC to reorganise internal and external business processes. Consequently, Covisint was a means to an end, supposed to enforce process harmonisation through the introduction of best practice processes and standardisation of ICT infrastructure across the corporation.

In the end, however, it can be argued that the management strategy was taken into consideration and played an important role in the choice of the positioning of DC within the sector. However, the strategic choice to collaborate with competitors aimed to benefit from the incentives of sharing cost and risk and to solve internal IT issues. Those IT issues then were significantly hampering the implementation of the standardised portal and were driving the dynamics. The reason for this was that the collaboration strategy chosen by DC led to compromises instead of a demonstration of power (in setting a flag with an industry standard). First, DC had not anticipated before the real effort of being involved in the development processes themselves. Secondly, top management had not foreseen that the implementation of the standardised solution would collide, for example with security concerns of the IT department, and would consequently lead to tough negotiations of single security aspects ending in compromises that were forced upon DC by the IT department. The causes of those compromises are considered in the next subsection.

Global solutions and the local adoption of best practice

In reference to the global best practice processes, an alignment of divergent interests was found to have significantly hampered the project progress. Associated with the cumbersome negotiations of single deliverables was the loss of control over resources and consequently over power experienced on the intra-organisational level (DC IT) in favour of an external player (Covisint). Triggered by negotiations, the various competing concerns with regard to the standardised solution were causing tensions between the key players. According to Ciborra and Hanseth (2000), apart from the globalisation aspect, the strategic alignment of key actors is responsible for the drift of planned and actual outcomes as well as for surprises: delays and unintended consequences, sudden oppositions and the imperfect attempt to align all stakeholders (ibid: 7).

The findings from the study suggest that the idea of a "best practice" solution to the development and implementation of a standardised technology should be reassessed, as the development and implementation of standardised portal technology depends on the individual situation of an organisation, and it is difficult to extrapolate a generic "best practice". Furthermore, the findings align with existing literature related to best practice processes such as Sørensen and Williams (2002) who argue that 'best practice industry processes' constitute of a 'technology developed around a template of work practices from the context of their early development and use'. These processes become confronted with user organisations and 'often proved to be stable where methods of operation become entrenched in working and management practices and in the cultures of organisations' (Sørensen & Williams, 2002: 226). This very strong evidence calls for a rethinking of the whole concept of a 'best practice industry standard' propagated by Covisint and the proponents within DC. An argument against 'best practice' is that the context in which such standardised processes are developed and implemented (e.g. pressure for collaboration in the automotive industry and cost reductions), the characteristics of the organisations involved (e.g. strategy and people involved) and the nature the technology itself (e.g. technical characteristics such as functionality) are linked together to determine a particular avenue that the technology development and implementation process follows. As Williams (1997) stated, the decisions and the choices vary as technology moves across social settings and across barriers of 'colliding' institutions of suppliers and user companies (Williams, 1997).

In this case, the best practice industry processes were taken as a sort of basic processes but adapted to the needs of DC. In what concerns the role of Covisint, they did not stop DC and during the course of the project overtook the altered processes which in turn had consequences for other members of Covisint. However, without the offered best practice standard solutions of Covisint the final 'glocalised' versions of those business standards would have never seen the light of day. Perhaps other shareholders of Covisint benefited from them?

Additionally, it has to be questioned whether best practices industry process standards offered by e-marketplaces such as Covisint really support organisations in their objectives to re-build their supply chain business processes. In the case presented, none of the deliverables of Covisint's standard solution were accepted without any change. From a technical point of view, this led to a much more complex technical architecture than it was before, which runs counter the original goal of a standardised IT architecture.

At the local level, the adoption of Covisint's best practice processes led to the occurrence of another phenomenon: the loss of control over internal resources. A consequence of the interconnectedness between the intra-organisational and the inter-organisational level led to a loss of control over resources and consequently of power originally controlled by the IT department.

Global solutions and the local adoption – the role of loss of control

According to mainstream economic literature, as well as to the case studies published by the IT vendors, IT is supposed to deliver substantial gains when linked into larger networks, as well as leading to a greater level of control over business processes. Furthermore, most of the management literature consists of concepts that deal with enhancement and extension of control over processes. However, control is difficult to achieve not only because of the globalisation and the vast complexity of the infrastructures, but also due to individual and organisational limitations and to the contextual power relationships. Finally, these aspects lead to a drift in outcomes envisaged at the outset of the project (Ciborra & Hanseth, 2000).

Particularly, the standardisation of infrastructure is claimed to incorporate network externalities which means that control over an infrastructure can be only partial. The diffusion of an infrastructure has its own accelerations and slow-downs, in a way that

is only indirectly correlated to the decisions made by the resource-owners. At this point the findings of this study align with the findings of Ciborra et al. (2000). However, although the level of control certainly was a big issue in the project and was translated in the negotiations between the different key players, it was particularly limited to one important key player: the IT department.
The drift of control over IT processes from DC IT to Covisint led to a very complex IT architecture and was far from being the harmonised and the cheaper solution envisaged at the beginning of the project. On the technical level, the IT architecture became significantly more complex and more expensive as before. Technical complexities, particularly in the area of security, patterned most of the outcome. Due to the required high level of security, and due to the fact that DC IT did not trust Covisint and constructed a fall-back solution in case of a breakdown of Covisint, the harmonisation of the IT infrastructure could not be achieved.

As described in subsection 7.3.3., the portal led to a re-distribution of power and control between the different departments on an intra-organisational level in favour of the inter-organisational level – control of IT processes and facilities was shifted from DC to Covisint. In the end, the competition over control and power led to the partial failure of the technology change. Finally, the global supplier portal was much more expensive than the solutions before and the goal to achieve a harmonised and standardised infrastructure led to a very complex IT architectural monster; Furthermore, Covisint failed to establish a *de facto* industry standard in the automotive industry.

As already reflected upon in the previous subsection, control was strongly related to the power aspect of negotiations and shaped the dynamics of the standardised portal technology. Power aspects in particular play a significant role when the ICT innovation such as the portal is developed and partly operated by a third party. However, in terms of ownership of control and the level of it, a pressing question in this context remains: who are the actors who control the project? How is control distributed amongst the key actors in a global network? And what are the consequences related to a shift in control (for example, the impact of control over access to and ownership of resources)?

The character of directed drift

As the framework implies and the analysis in the previous chapter have illustrated, a directed drift such as a change in the project goals does not automatically lead to chaos. In this study, the drift was directed by the circumstances and meant a shift from the original planned outcomes to the outcomes reached, either expected or unintended. In addition, the drift-triggering elements patterned the final outcomes, but did not determine them. In consequence, this meant that outcomes did not completely differ from the original plans. The reason for this is well-founded in the configurations, events and actions of the key players which were more likely to happen than others. This was largely based on the fact of the pre-project phase and the context in which the project took place had driven the decision-making of the actors.

However, the size of the project in this case and the volume of complex expertise that was partly outsourced showed a large amount of responsibility and control for the change project. Although DC had chosen a very professional approach to introduce a very sophisticated project management, trade-offs and the directed drifts within the project were unavoidable. One reason certainly was the large size of the global project and the overarching socio-technical complexity. Another reason was that drifts can be considered as a normal part of every project occurring during the course of events which can not be anticipated before.

What the MSID framework can and cannot achieve

The MSID framework could have been developed from different perspectives. In order to limit the analysis I introduced the DC perspective. From a Covisint perspective, a totally different picture, for example in terms of the nexus of technology development, would have been illustrated. The exclusive DC perspective was one limitation of the research design and the analytical framework, which had significant consequences, such as a limited explanation of the role played by other actors.

In studying drift and dynamics as a phenomenon during the diffusion of information infrastructures, Ciborra et al. (2000) suggest that the *"interplay between the intervening factors is too complex and no model can capture the dynamics and their final outcome which remain open and highly dependent upon local circumstances"* (ibid: 7). The development of the model applied to the empirical case aimed for two goals. First, it was understood as an attempt to structure the sheer complexity of the socio-technical setting. The mapping out of different levels allowed for a better understanding of the political processes within the standardisation arena patterning the outcomes. Secondly, the model provided a language to discuss the complex trade-offs as part of the outcomes; for example the global – local paradox. The model was not developed to solve the complex system of drift because the fix of one of the shaping factors of dynamics would have started another set of problems. This clearly was beyond the scope of this study and will be a topic for further research.

Summary

In a very detailed way, the study highlighted these contradictions as a vital part of the outcomes. They were grounded in the pursuit of various interests, underlying conflicts and power struggles between the actors. They all played an important role in explaining the partial failure of the standardised portals 'best practice industry processes' both to achieve an industry-wide standard for standardised portal technology and to benefit the companies involved. In the end, there was nothing left of the global solution of best practice processes originally offered by Covisint. They were completely adapted to the local needs of DC which underpins the claims of Ciborra and Hanseth (2000) that the goal to search for 'best practice' *"is an illusion"* (ibid: 5). Any implementation of IT produces trade-offs; the trick is to balance the extremes.

Within this chapter I have already deepened our understanding of the dynamics of ICT innovations, while recapitulating the findings of the case analysed by applying the framework that I have developed. The model flexibly allowed moving back and forth between the micro and meso level of analysis. The zooming in and out revealed that within the complex socio-technical setting a multi level game is at play. So far,

the study has found that apart from inter-organisational alignments between the key players, intra-organisational alignments were taking place and were patterning the subsequent outcomes. However, there is evidence throughout the entire study that there is another level of alignment – the individual one. As Hutchins (1995) claims, an individual is simultaneously involved in multiple histories. Human conduct is part of the unfolding of a task, the development of the individual doing it, the development of the work organisation, and the development of the professional practice. Accordingly, no different layers or contexts exist because they all take place in one and the same activity (Hutchins, 1995 cited in Hyysalo, 2004: 12).
When translated to the case this means that being part of a change project opens the opportunity to acquire knowledge and build a certain reputation which then may well be traded at a later point of time as expertise. As the individual alignment and the trading of professional experience turned out to be an important finding of the study, it will be analysed in the next subsection with a focus on personal career advancement on change projects.

The actors' personal career advancement through projects

Over a time period of nine months the events shaped not only the course of the project but also the individual career paths of portal team members, particularly for those who were part of DCXnet. Studying socio-technical change projects involves not only new technologies that are shaped within the local context in an adopting organisation, but also an awareness that these projects are subject to vulnerability and need a more contextually-based understanding. In large organisations such as DC, besides every day work, a number of projects are underway. The creation of a project team is a specialised exercise in matching expertise as well as personalities to deliver a service or design or to improve a product. Project-based teams are usually involved in new knowledge creation or in the application of existing knowledge to a particular situation. Often, project teams involve key individuals called 'change agents' who are a legitimised group or persons who implement corporate strategies and change programmes to drive organisational change. Within companies, change agency usually has a very good reputation and is attractive for individuals because they qualify for a better position after the change project and may advance their career in the case that the project had been successfully implemented. Within the development and implementation of a socio-technical change programme, a change agent has access to resources and often has the chance to advance his or her personal agenda. This career advancement can either take place by getting access to new communities of interest and new actors with influence, or by increasing knowledge and expertise.

In general, the change agent is concerned with managing organisational change in a proactive way. This makes him/her an individual who is seen as the driver for change in the organisation in contrast to those who are neutral or even actively resist change (Buchanan & Storey, 1997). The challenge of a change agent is to 'unfreeze' existing attitudes and behaviour which restrains change while executing a particular change programme (McLoughlin, 1999).

However, the concept of change agency can be criticised for a number of reasons. First, one question to answer is whether every actor involved in a socio-technical change project can be the change agent. This question fundamentally implies the underlying line of argumentation of the existence of a particular department dealing with change. Secondly, it remains unclear if the individuals designated to fill-in the change agents' role are really the right persons to do the job. As outlined in chapter two, the role of a change agent requires a special skill set incorporating, for example, communication skills to initiate, coordinate and facilitate change (Buchanan & Storey, 1997). Thirdly, as Pettigrew et al. (1992) claimed, it is necessary for the organisation in a broader contextual and historical sense to possess the 'capacity to change' (Pettigrew et al., 1992: 6 cited in McLoughlin, 1999: 77). Thus, the question draws attention to the way in which change agents secure legitimacy through political action. For the actor to gain legitimacy, intervention in the political and cultural systems of organisations are required in order to engage in the 'management of meaning' (McLoughlin, 1999: 78). These engagements include mobilising aspects. However, these engagements are interpretative processes whereby change agents construct their own vision of internal and external context (ibid).

Nevertheless, despite the discussed pros and cons, change agency and the individuals working as change agents are surrounded by a prestigious reputation within organisations. Consequently, the reintegration of projects and the project team members previously part of a change agent department in a departmental hierarchical structure causes problems for the actors of both sides. The project team members particularly change agents, experience difficulties in adapting to the hierarchy and the everyday work in a formal structure as they have lost their prestigious status, for example the proximity to the legitimated power in the corporation. From an individual perspective, the reintegration of a project in a company's hierarchical structure means loss of reputation and loss of access to power and resources; including career advancement opportunities. For the individuals working in the department, the situation is also very difficult. They have to work now on a daily basis with former change agents who are supposed to be part of the elite of the corporation. Personal integration of the change agents is difficult because they are supposed to compete with departmental individuals for further career options and positions in the hierarchy. In addition, reintegration of change agents in the formal structure may lead to a serious slow-down of project progress and therefore the success of the project might be in danger. Due to the fact that no further career advancement is likely, former change agents completely lose their ambitions related to the achievement of project objectives.

Existing literature points to the fact that expertise in relation to functional roles is not only a result of individual's functional roles, but also in management strategy. Moreover, it found that roles are constructed both through bottom-up and top-down strategy as individuals pursue their own occupational and organisational interests (Williams & Procter, 1998). The findings of the study partly confirm with this research and suggest that although often large organisations use projects and project champions to drive organisational change, their management may be problematic – for example where top management suddenly changes their agenda and the project is stopped or – like in the portal case – halfway through the complete project organisation is reintegrated in the organisation's hierarchy. Expertise and the related reputation is not only constructed but also validated through a two-way interaction in hierarchies and may lead to an expert reputation or higher status as well as to conflicts of access to power and resources (Williams & Procter, 1998: 197). The re-integration of the change agency DCXnet decided by the TM was an unforeseen event in a very early phase of the project. This decision was a political one and solely reflected the TMs own agenda: due to the course of the project, the top management decided that they could not advance their own personal agenda with the project and therefore re-integrated the DCXnet department in the GP&S organisation.

As an immediate effect, this led to the slow-down of the project because the individuals who were formerly change agents left the departments where they were integrated – perhaps due to unhappiness about a different culture and a loss of reputation to advance their own personal career. However, those types of people have special knowledge and skills which also left and subsequently harmed the project in the sense of achievement of deliverables. Heimer (1984) specifically explored the issue of individual control over career development in project work because in these settings, control over careers is particularly problematic. According to Heimer, control over a career means control over a series of elements such as the development of personal ability or recognition by top management. She claims that no one can control a career as such and that career development depends on a series of factors, some of which facilitate individual control and others of which are constrained by organisational policies and larger forces (Heimer, 1984). Here observation is confirmed here insofar as the expertise of the change agents of DCXnet was locally constructed through the interplay between managerial strategies (the decision to re-integrate the project within GP&S) and the occupational structures (the project until a certain point), which, in turn, is enacted through political economy of expertise within an organisation (ibid).

8.3 Implications for practice and closing remarks

The picture I have found was far removed from the simply technical or economic rationalities envisaged by economic, strategic management or technocratic accounts. The case-study highlighted instead the close interplay between the unfolding standardisation effort and the complex socio-technical setting in the array of firms involved, including supply chain relationships, the array of existing installed technologies, attendant relationships between technology supply, and the complexities of inter-departmental and inter-organisational politics. These shaped and moderated the processes of the entire lifecycle of standardised technology, its evolution and outcomes within the course of the project.

Apart from the theoretical contribution, the case study has shown a number of lessons learnt for practice regarding (1) standardisation and the so-called 'best practice standard processes' in general, and (2) projects as drivers for technical change as well as individual career advancement in particular.

(1) First, standardisation efforts are triggered by a complex array of technical and organisational-political considerations. The standardisation process itself and consequently the range of actors involved and their manner of involvement in the process changed due to a re-configuration of key players and the solution within the standardisation arena. Furthermore, standard business processes appear to suffer significant transformations during implementation. Such transformations occur as a result of the effort of the adopters of standards to fit the standards and consequently the standardised technology to their specific needs and requirements. The most immediate factor that appears to influence the nature of such transformations in the character of the standardised technology during implementation is organisational culture and the organisational repertoire (Whipp & Clark, 1986). The embedded rules and procedures and the specific working practices within each organisation shape and transform the best practice standard processes during the implementation stage. The strong influence of the user organisations' culture and competing goals of the actors during this process could be explained by the change in the locus of standardisation process: whereas development takes place within the specific standard development consortium, implementation takes place within the settings of each individual organisation.

As suggested by Jørgensen and Sørensen (2002), as well as in this study, this may lead to the result that technological fixes incorporate technological expectations and visions and play an important role in terms of priorities assigned to development strategies and configurations of technical solutions. The number of competing goals has led to compromises. Consequently, related to standardised business processes, depending on a company's strategy, best practice can fit better or even not at all but there is no 'one size fits all'. In addition, a clear allocation of responsibilities within the organisations involved in the project has appeared as strong facilitator and/or inhibitor of the success of standards implementation. Personal relationships facilitate communication and understanding between actors, which ease the implementation process. The lack of clear allocation of responsibilities within the participant organisations was found to impede progress during implementation. Other factors that have contributed to the delay or even failure of the implementation process were the users' perception regarding technologies' benefits: if they are not clear, or were perceived as distributed in an unbalanced way between actors, then progress is hampered.

(2) Second, in today's organisations projects are a legitimised organisational form to driving organisational and technical change. Due to technical advances in ICT and market pressures caused by globalisation (such as business process outsourcing, or 'BPO'), the development and implementation of networked systems in large organisations are increasing but are also remaining increasingly complex due to social, political, economic and technical factors; for example a patch-worked IT infrastructures or complex supply chain relationships. Although large organisations are used to implement complex large-scale technology projects, they have to rethink their strategy in terms of the normative project approaches applied to complex project configurations. They might be sophisticated but they are only one component to successfully achieve project goals defined in the beginning. Moreover, it had turned out to be important to include into the project configuration a second component: experiences and lessons learned from a pre-project phase or from similar projects.

The adoption of new technologies is often characterised by the sheer complexity of change management (taking into account divergent individual and departmental goals) and leads to a drift from the original goals defined. The pursuit of personal career goals can hamper project timelines or even the success of a whole project. To limit the personal agenda setting, the introduction of an incentive system to align vested interests with project objectives could be a solution.

Finally, the above mentioned differing individual and departmental goals are evident and are interesting managerial problems. A change in the company's strategy in the middle of a project is leading to undesired side-effects in terms of stabilisation of a project configuration, including all the related consequences in terms of delays and project quality of outcomes. Project members should stay on a project during the entire project duration because those people manage transition of knowledge and expertise to others in the team and beyond. Further, the project should be used to develop individual careers as well as to let project members acquire capabilities and expertise.

Based on many years of experience in different industries as well as in consultancy, I gained insights into various mostly technology-driven, projects. In a wide range of situations, the issues were very similar to those experienced in the portal case. Organisational politics pattern decision-making instead of rational economically driven considerations, and often the 'technical' is taken as a pretext to hide behind uncertainty. However, in the subsequent everyday project work, at least half of the problems were of a technical nature where most of the project team had no answer due to either lack of skills, knowledge or experience. Consequently, this led to the unwanted leadership of technically skilled people.

However, amongst others in the project team, this leadership created an atmosphere of uncertainty based on the lack of technical knowledge compared with mistrust and doubts towards issues and decisions shaped by more skilled and experienced people. Related to this fact, generally, functional departments tend to employ only staff with a single education, for example in a purchasing department they only employ those with a purchasing background. However, in the project reality, multidisciplinary skills are required in order to progress in the course of events. Functional departments should give up the one-way politics in staffing and focus more on a multidisciplinary mix of staff with different skills and expertise.

Through the knowledge and experience I gained in this study, I think social sciences should play a far greater role in projects than they are at present. In a company, top management should accept the fact that innovation projects are not only driven by technical challenges but also by social and cultural ones which constrain or enable the success or failure of adoption of emerging technologies.

8.4 Limitations of the study and further research

Conducting a longitudinal single case study, underpinned by the unique opportunity to engage as a participant observer, have been helpful in order to explore the different types of social aspects in shaping the outcomes of standardisation. For example, the case has highlighted the importance of access to the pre-project phase and the significant role power and networks play in patterning the outcomes of standardised ICT innovations at company and industry level. However, while power might have been relevant in the Covisint global supplier portal case, other relational characteristics such as trust might prove more relevant in other cases.

This study has a number of limitations that provide suggestions for future research. First, the case provided "thick descriptions" (Stake, 1995) enabling the researcher to gather useful insights into the rich social processes that underline technology development and to explain the way in which actors' choices were made and the conditions under which a particular outcome was produced (Russell & Williams, 2002). On the one hand, the position of a participant observer offered the unique chance to gain unlimited access to a vast amount of information and enabled the research to follow the adoption of a standard from the beginning to the end of the process. On the other hand this perspective simultaneously served to limit my objectivity. As someone involved in this story I am part of particular narratives and perspectives. This had two downsides. First, the study was directed by the very special viewpoint of an 'insider', personally influenced by the course of events and the active involvement in the project. Within the project, I was part of the DCXnet team and therefore at least partly responsible for the achievement of some results.

My physical presence in meetings or workshops and the continuous work with most of the project team did not necessarily help to increase objectivity during writing. However, to fix this issue of this very personal view of the DC organisation, a number of interviews have been conducted with Covisint, IBM, part suppliers, SupplyOn, other OEMs and naturally with some people of the project team after the pilot went live. These interviews helped the research to uncover the perspectives of the other participants in and outside of the project.

Secondly, as already mentioned above, my long track record of professional experience and expertise led to the same level of involvement in the project as other team members. Therefore, I had access to information other project members had did not have access to and this shaped my perspective on on-going action and configurations. Finally, all this practical expertise and experience turned out not to be a real asset for theoretical deliberations. Decades of working experience in a technically oriented environment encouraged a practical engineering and solution-oriented way of thinking. Another closely related factor is the fact that my engineering education and work expertise hampered my ability to express the findings in the appropriate sociological language.

A single study might be descriptive, but nevertheless delivers useful and in-depth insights. A single case study helps to explain the particular way in which choices were made, and the specific conditions which pattern a particular outcome. Such an in-depth view allows the single case study research design to tackle questions such as what would have been required to produce a different result or what changes would have shifted the outcome in what direction (Sørensen & Williams, 2002: 89).
The single instrumental case study design was useful at this stage of the research to allow the researcher to gather an in-depth understanding into the phenomenon under study so as to build-up a very detailed view of a single sector. In order to obtain such a detailed picture, a generic overview of the variety of factors shaping its formation and how they imposed upon success or failure were sacrificed. This means that the generalisability of the findings is limited. Therefore, future research could concentrate on different aspects. One could be to do an exploratory research

approach and to verify the robustness and generalisability of the findings of this research; or to conduct a multi case study research design to compare and contrast portal developments and implementations in different settings. To identify the social aspects relevant to the development and implementations of standardised portal technology a large scale survey of developers and users of portals should be conducted. Further research should include other industries such as the chemical industry or the energy sector where portal coalitions have been formed. Such a qualitative approach to the empirical research could be aided by the use of quantitative methods such as surveys of industry portal users to confirm the results through triangulation.

Finally, future research could address the role that trust and power play together in shaping the development and implementation of standardised technology of industry consortia. The emergence of standards coalitions often depends on the nature of existing relationships among potential members (Foray, 1994), with coalitions often forming around existing structures within the sector, such as user associations (Graham et al., 1995). To research the role that trust and power play in shaping the emergence of standard coalitions would need a larger scale set of surveys to map the different dynamics of supply chain interactions in different sectors. Despite these limitations, this study has been important because it allowed for the development of a new MSID framework, with special emphasis on the particularities of historical and social settings.

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Appendix 1: Interview guideline for interviews at DC

DC	Questions	Notes
IT, Business		
	Can you give an overview of your business/IT strategy and where the portal fits in?	History behind Challenges, benefits
	What were the major factors that you think influenced the development/implementation of the portal strategy?	Factors (i.e. i.e. costs, business – i.e. business strategy, customer demands), organisational (working practices) and social (politics, resistance to change), => identify the people that shaped the portal strategy What departments are these people representing (=> identify different interests)? What is their expertise (maybe it explains their participation, or the way in which the strategy was developed)?
	What (reasons) /who (actors) drove the development and implementation of the portal?	Who are the people (actors) who played a central role in the IOS strategy?
	Description (technical implementation) of the project	History, Different actors, circumstances,…situation before
	Benefits/challenges during implementing the standard?	With examples: UI, registration process; migration user management…
	Did the original portal change during implementation? If so, how? What were the reasons for such a change?	Influence of single stages, which actor was responsible/influences, what factors led to a change?
	Individual perception of outcomes. How do these match the expectations? If gap, what does he think is the principal reason for this?	Identify different perceptions depending on different users/context => identify if different users have had a similar experience of the portal

Appendix 2: Interview guideline for component suppliers

Supplier	Questions	Notes
	▪ Have you actively participated in supplier portal projects? If so, what was your personal perception in terms of implementation process & outcomes? ▪ What were the reasons for which you become involved into portal projects? ▪ Who was in charge with the decision for you to participate?	Any benefits (for the project or for the department or for the individual?) perceived for participation?
	▪ Can you give me an overview of a typical portal project and your daily work with the portal?	(Portal= standardised portal technology= standardised processes => issues?)
	▪ Can you discuss the facilitators & inhibitors of implementation (success). ▪ Which one in your opinion is the most significant one?	Try to identify the importance/criticality of each of the different categories of factors (technical/social/economic)
	Benefits/issues compared to the situation before ▪ Is your company (you) involved in other portals? ▪ How would you compare this project (in terms of both implementation process and outcomes) to the implementation and outcomes of the other portals?	Covisint vs. VWGroup or BMW portal Here he might not have direct experience from being involved in other portals implementations …
	▪ What are the major outcomes for yourself/your company as a result of the implementation & use of the portal?	

Appendix 3: Interview guideline for IT supplier

IT supplier	Questions	Notes
	Can you briefly describe your position/experience within IBM?	
	What are the business reasons, why companies looking for your support in the area of B2B? What are you doing better than others?	
	Describe a typical portal project where IBM has been involved.	Stages, resources, etc.
	What do you think about standardisation in this context?	
	Can you describe the business relationship of IBM and DC?	
	When and how did you get involved in the DC supplier portal project?	History, background
	In a standardised portal, standardised processes are part of and have been developed beforehand. Can you describe the development process (of standardised processes)? ▪ Who was involved? ▪ For what reasons? ▪ Inhibitors, facilitators What happened during the implementation?	Process, challenges
	In terms of the DC supplier portal, what is your perception of: ▪ The overall outcome of the project ▪ Covisint ▪ Compared with other supplier portals (e.g. VWGroup)?	

Appendix 4: Interview guideline for Covisint

	Questions	Notes
Covisint story	Overview of Covisint development. Where did the resources (money, people, expertise) come from?	History, What were the reasons/the idea behind Covisint and the standardised portal?
Development	How did you develop the standardised portal?	
Implementation of portal	Can you tell me about a typical portal implementation at an OEM? Challenges and how you overcame them?	Not only DC but other OEMs, too.
Technology/systems	To what extent does the technology underlying the portal, makes a difference for processes, suppliers, OEMs?	Why, how?
	What are differences/similarities btw EDI & portal? ▪ On processes ▪ On the development and implementation process ▪ On the relationship between OEM & Supplier	